

TRAINING MANUAL

PLASMA DISPLAY PANEL 2006 v2

60PY2DR

50PY2DR

50PX4DR

50PC1DR

50PC1DRA



Digital Display

IMPORTANT SAFETY NOTICE

The information in this training manual is intended for use by individuals possessing an adequate background in electrical equipment, electronic devices, and mechanical systems. In any attempt to repair a television or monitor, personal injury and property damage can result. The manufacturer or seller maintains no responsibility for the interpretation of this information, nor can it assume any liability in connection with its use. When servicing this product, under no circumstances should the original design be modified or altered without permission from LG Electronics. Unauthorized modifications will not only void the warranty, but may lead to property damage or user injury. If wires, screws, straps, clips, nuts, or washers used to complete a ground path are removed for service, they must be returned to their original position and properly fastened.

CAUTION

To avoid personal injury, disconnect power before servicing this product. If electrical power is required for diagnosis or test purposes, disconnect the power immediately after performing the necessary checks. Also be warned that many household appliances present a weight hazard. At least two people should be involved in the installation or servicing of such devices. Failure to consider the weight of an appliance could lead to physical injury.

ESD NOTICE

Some of the electronics in appliances are electrostatic discharge (ESD) sensitive. ESD can weaken or damage the electronics in these appliances in a manner that renders them inoperative or reduces the time until their next failure. Connect a wrist strap to a green ground connection point or unpainted metal in the appliance. Alternatively, you may touch your finger repeatedly to a green ground connection point or unpainted metal in the appliance. Before removing a replacement part from its package, touch the anti-static bag to a green connection point or unpainted metal in the appliance. Avoid unnecessary contact with electronic parts or terminal contacts. Handle the electronic control assembly by its edges only. When repackaging a failed electronic control assembly in an anti-static bag, observe the above instructions.

REGULATORY INFORMATION

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures: Reorient or relocate the receiving antenna; Increase the separation between the equipment and receiver; Connect the equipment into an outlet on a circuit different from that to which the receiver is connected; Consult the dealer or an experienced radio/TV technician for help.

The responsible party for this device's compliance is:

LG Electronics of Alabama, Inc.

201 James Record Road

Huntsville, AL 35824, USA

Digital TV Hotline: 1-800-243-0000

Published 2006 by LG Training

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SAFETY INSTRUCTIONS

OVERVIEW

1. Read these instructions and the instructions in owners and service manuals.
2. Keep these instructions.
3. Heed all warnings.
4. Follow all instructions.
5. Do not use this apparatus near water.
6. Clean only with dry cloth.
7. Do not block any ventilation openings. Install in accordance with the manufacturer's instructions.
8. Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
9. Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding type plug has two blades and a third grounding prong. The wide blade or the third prong are provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
10. Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles, and the point where they exit from the apparatus.
11. Only use attachments/accessories specified by the manufacturer.
12. Use only with the cart, stand, tripod, bracket, or table specified by the manufacturer, or sold with the apparatus. When a cart is used, use caution when moving the cart/apparatus combination to avoid injury from tip-over.
13. Unplug this apparatus during lightning storms or when unused for long periods of time.
14. Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has exposed to rain or moisture, does not operate normally, or has been dropped.
16. **WARNING - To Reduce The Risk Of Fire Or Electric Shock, Do Not Expose This Appliance To Rain Or Moisture.**
17. **Wet Location Marking :** Apparatus shall not be exposed to dripping or splashing and no objects filled with liquids, such as vases, shall be placed on the apparatus.

POWER CAUTION

Most appliances recommend they be placed upon a dedicated circuit; that is, a single outlet circuit which powers only that appliance and has no additional outlets or branch circuits. Check the specification page of this owner's manual to be certain. Do not overload wall outlets. Overloaded wall outlets, loose or damaged wall outlets, extension cords, frayed power cords, or damaged or cracked wire insulation are dangerous. Any of these conditions could result in electric shock or fire. Periodically examine the cord of your appliance, and if its appearance indicates damage or deterioration, unplug it, discontinue use of the appliance, and have the cord replaced with an exact replacement part by an authorized servicer.

SAFETY

Protect the power cord from physical or mechanical abuse, such as being twisted, kinked, pinched, closed in a door, or walked upon. Pay particular attention to plugs, wall outlets, and the point where the cord exits the appliance.

ELECTRICAL SAFETY NOTICE

Many electrical and mechanical parts in this chassis have special safety-related characteristics. These parts are identified in the Schematic Diagram and Replacement Parts List. It is essential that these special safety parts should be replaced with the same components as recommended in this manual to prevent , Shock, Fire, or other Hazards. Do not modify the original design without permission of manufacturer.

ELECTRICAL SHOCK WARNING

An Isolation Transformer should always be used during the servicing of a receiver whose chassis is not isolated from the AC power line. Use a transformer of adequate power rating as this protects the technician from accidents resulting in personal injury from electrical shocks. It will also protect the receiver and its components from being damaged by accidental shorts of the circuit that may be inadvertently introduced during the service operation. If any fuse (or Fusible Resistor) in this monitor is blown, replace it with the same specified type. When replacing a high wattage resistor (Oxide Metal Film Resistor, over 1W), keep the resistor 10mm away from PCB. Keep wires away from high voltage or high temperature parts.

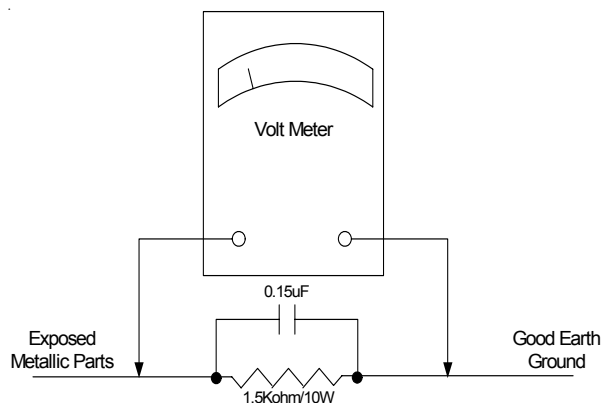
LEAKAGE CURRENT COLD CHECK (ANTENNA COLD CHECK)

With the instrument AC plug removed from AC source, connect an electrical jumper across the two AC plug prongs. Place the AC switch in the on position, connect one lead of ohm-meter to the AC plug prongs tied together and touch other ohm-meter lead in turn to each exposed metallic parts such as antenna terminals, phone jacks, etc. If the exposed metallic part has a return path to the chassis, the measured resistance should be between 1M ohm and 5.2M ohm. When the exposed metal has no return path to the chassis the reading must be infinite. An other abnormality exists that must be corrected before the receiver is returned to the customer.

LEAKAGE CURRENT HOT CHECK

Plug the AC cord directly into the AC outlet. Do not use a line Isolation Transformer during this check. Connect 1.5K/10watt resistor in parallel with a 0.15uF capacitor between a known good earth ground (Water Pipe, Conduit, etc.) and the exposed metallic parts. Measure the AC voltage across the resistor using AC voltmeter with 1000 ohms/ volt or more sensitivity. Reverse plug the AC cord into the AC outlet and repeat AC voltage measurements for each exposed metallic part. Any voltage measured must not exceed 0.75 volt RMS which corresponds to 0.5mA. In case any measurement is out of the limits sepcified, there is possibility of shock hazard and the set must be checked and repaired before it is returned to the customer.

LEAKAGE CURRENT HOT CHECK CIRCUIT



MODEL SPECIFICATIONS

MODEL SPECIFICATIONS

This section covers some of the past and present LG and Zenith Plasma Display Panel (PDP) TVs and monitors. All models support computer input and RS-232, but not all models support High Definition (HD) input. Most PDPs feature similar features and specifications. Some of the newer (2005+) models have built-in ATSC tuners and support CableCARD™. Note that Commercial models don't have CableCARD™ support since it is not needed in a distribution network.

KEY TERMS

SDTV - Standard Definition (480i).

EDTV - Enhanced Definition (480p).

HDTV - High Definition (720p, 1080i).

XD Engine™ - Six distinct processes contribute to picture improvement.

CableCARD - Decoder card for digital cable.

HDMI - High Definition Multimedia Interface. Alternative to DVI. Smaller connector and supports audio.

HDCP - High-bandwidth Digital Content Protection.

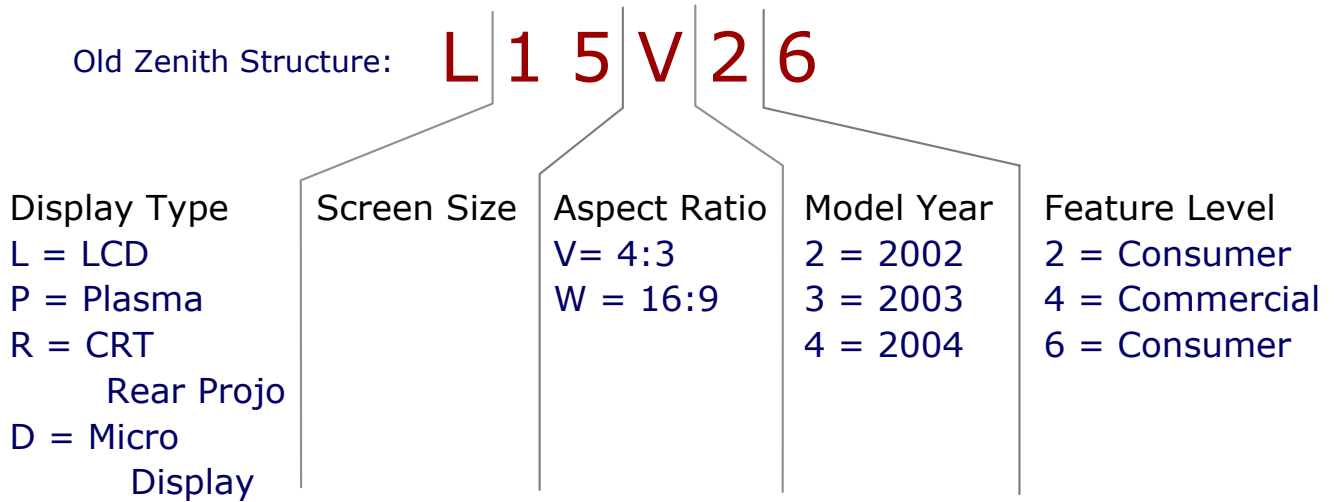
MODEL LIST

Below is a list of all PDP models. This manual focuses on the newer 2005/2006 models, but the others are listed for reference.

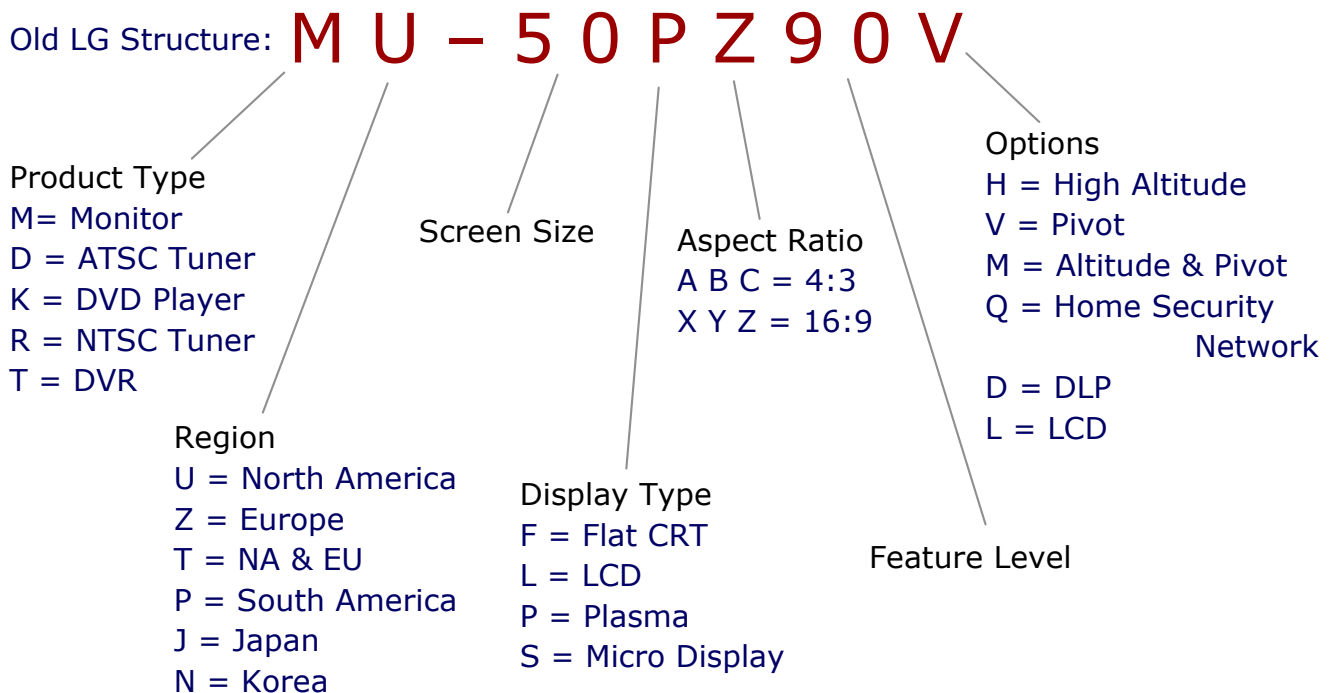
40" EDTV	42" HDTV	42" EDTV			
DPDP40	42PC1DA	DU-42PZ60	MU-42PZ15VB	P42W22H	RU-42PX10
DPDP40V	MU-42PM12X	DU-42PZ70	MU-42PZ41	P42W24B	RU-42PX11
MU-40PA10C	DU-42PX12XC	MU-42PX11	MU-42PZ41VB	P42W24BX	RU-42PZ90
MU-40PA10		MU-42PZ10	MU-42PZ90	P42W24P	MU-42PM11
MU-40PA15		MU-42PZ10B	MU-42PZ90C	P42W34	42PX3DCV
P40V22		MU-42PZ11	MU-42PZ90H	P42W34H	42PC3D
P40V24		MU-42PZ11B	MZ-42PZ34	P42W34P	42PM3MV
MU-42PZ11B		MU-42PZ15	P42W22	P42W46X	42PX4D
		MU-42PZ15A	P42W22B	RU-42PX10C	42PX5D
50" HDTV		60" HDTV			
DU-50PZ60	P50W26B	50PX2C	D60DVMS	MU-60PZ12A	P60W38
DU-50PZ60H	50PB2DR	50PX2D	D60DVSA	MU-60PZ12B	P60W38H
MU-50PZ41	50PC3D	DU-50PX10C	DPDP60	MU-60PZ12VB	60PY2DR
MU-50PZ41B	50PC1DRA	MU-50PM10	MU-60PZ11	P60W26	60PB2DR
MU-50PZ41V	50PC1DR	50PY2DR	MU-60PZ11B	P60W26A	MU-60PZ95V
MU-50PZ41VB	50PY2DR	50PX4DR	MU-60PZ12	P60W26H	MU-60PZ10B
P50W26	50PM1M	50PX1D	MU-60PZ15	P60W26P	60PX4DR

MODEL NUMBER FORMATS

OLDER ZENITH PRODUCTS (2000-2004)



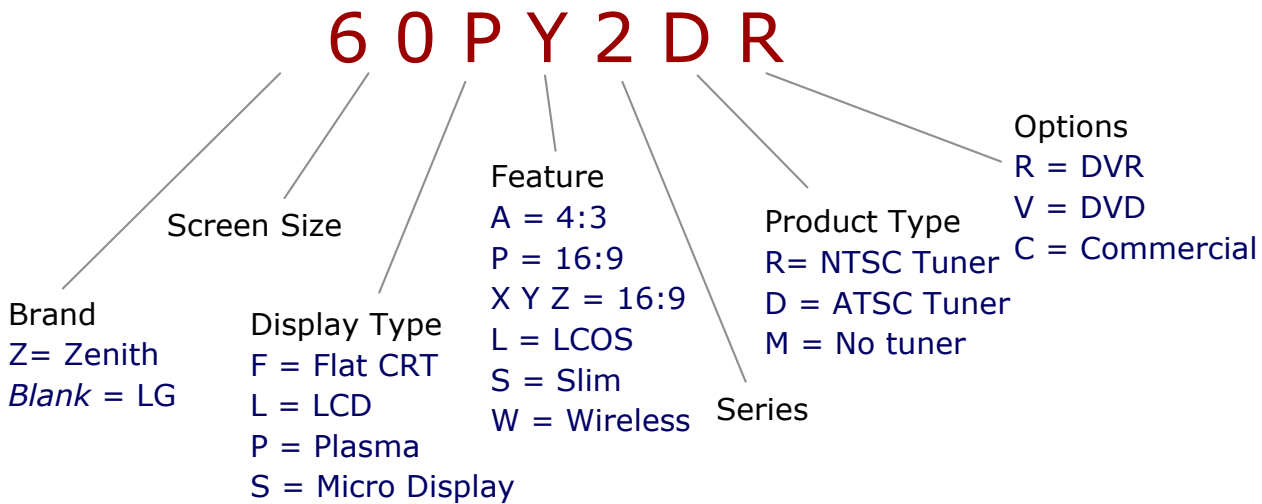
OLDER LG PRODUCTS



MODEL SPECIFICATIONS

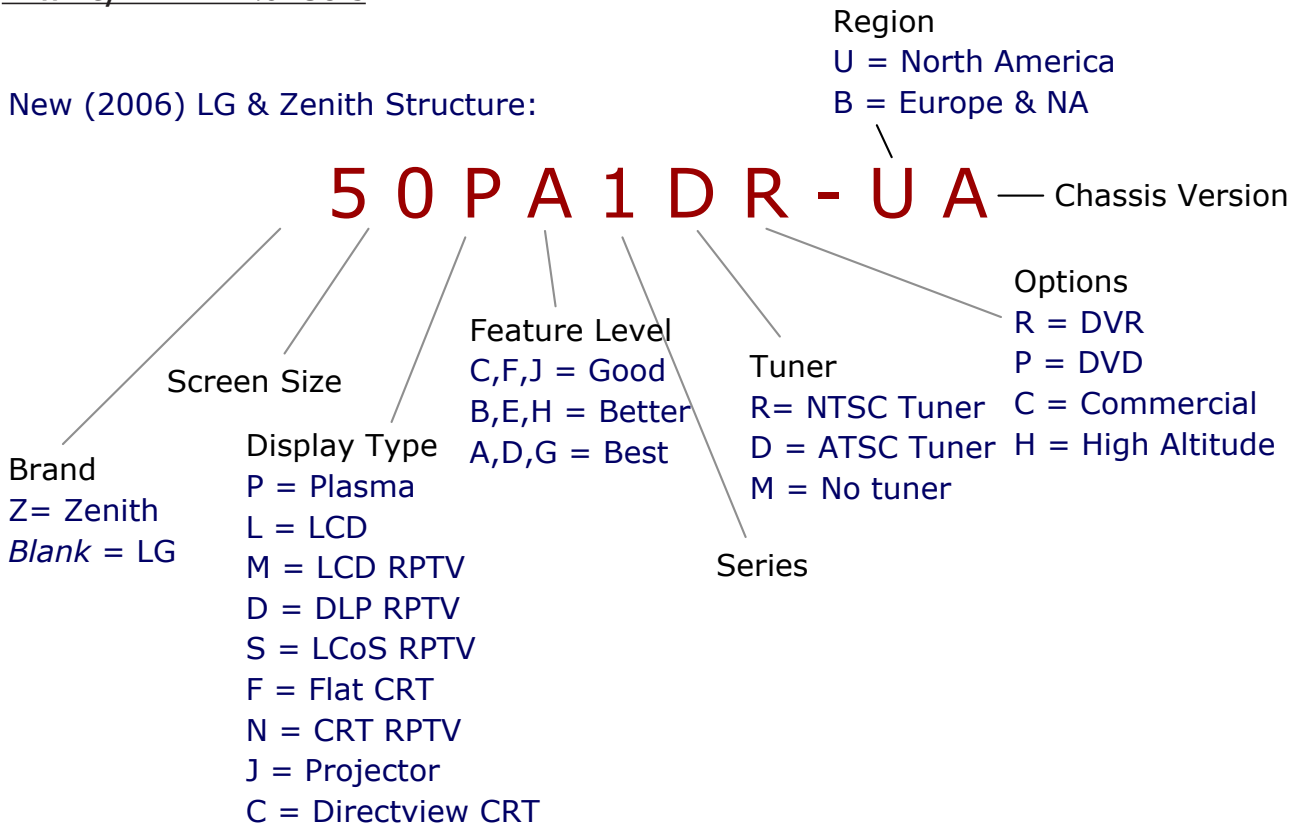
2005 LG/ZENITH PRODUCTS

Current (2005) LG & Zenith Structure:



NEW LG/ZENITH PRODUCTS

New (2006) LG & Zenith Structure:



MODEL NUMBER REVIEW

You should now be able to determine the approximate age of an LCD TV by its model number. Below is an example using 15" LCD TVs.

New Models (2006): 15LC1R

2005 models: 15LA6R and Z15LA7R

Older models (2003-2004): RU-15LA61 and L15V36

Older models (2002-2003): L15V26

Original Model (1999-2002): ZLD15A1

SERIAL NUMBER FORMATS

1) @ A B C D E F G H I

@=Year

A,B=Month

C,D=Factory Code

E-I=Sequential number (Some MWO models such as "SBM6500B" and "SBM6500W" have 6-digit sequential number from E-J.)

Product: LG (Goldstar) Brand

2) @ A B C D E F G H I J K

@=Year

A,B=Month

C,D=Factory Code

E,F=2 digit Secret Code

G-K=Sequential number (Some MWO models such as "SMB6500B" and "SMB6500W" have 6-digit sequential number from G-L.)

Product: LG (Goldstar) Brand (Some Products after January 2004)

3) @ A B C D E F G

@=Year

A=Month (1-9: Jan – Sep., 0: Oct, N: Nov, D: Dec)

B-G=Sequential number

Product: Zenith Brand DVD/VCR (Old Serial No)

4) @ A B C D E F G

@=Year

A, B=Month

C-G=Sequential number

Product: Zenith Brand DVD/VCR (Old Serial No)

5) @ A B- C D E F G H I J

@=Year

A=Factory Code (5: Pyungtaik (PT), 8: Shanghai (SH), 9: Indonesia (DI), H: Haeju)

B=Shift (1 or 2)

C=Production Line

D=Day of the week produced (Sunday: 1, Monday: 2, etc.)

E,F=Calendar Week Produced

G-J=Sequential number

Product: Zenith Brand DVD/VCR/ZHS (New Serial No) [DAV Division Products]

MODEL SPECIFICATIONS

6) @ A B- C D E F G H I J

@=Year

A=Factory (1: Kumi (DND), 2: Reynosa CTV, 3: Reynosa Wall Projection TV, 4: Five Rivers, 5: Daewoo, 6: Action, 7: Hitachi, 8: Juarez, 9: Springfield, A: Kumi (DID), B: Mexicali (LGEMX))

B=Shift (1 or 2)

C=Production Line

D=Day of the week produced (Sunday: 1, Monday: 2, etc.)

E,F=Calendar Week Produced

G-J=Sequential number

Product: Zenith Brand TV/TVCR/PTV/HDTV/Projector

7) @ A B- C D E F G H I J K

@=Bar-code Start digit must by 0

A,B=Factory Code

C=Line Code (T1: 1, T2: 2)

D=Year

E,F=Month

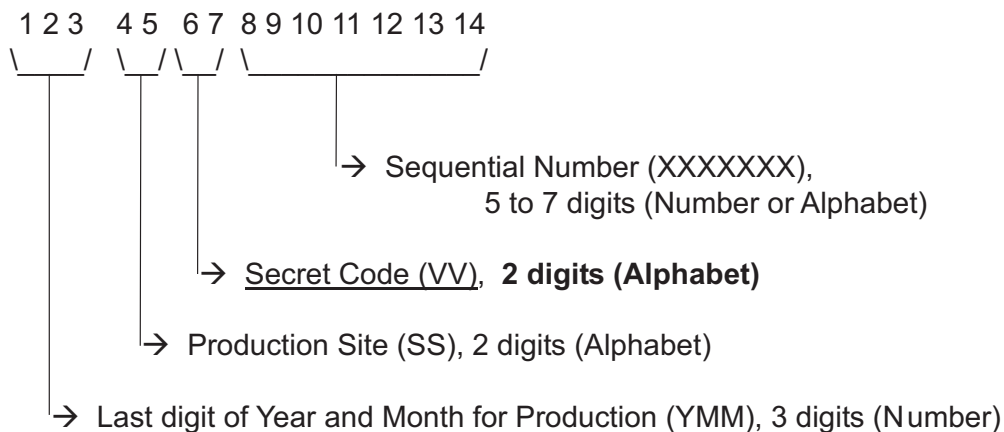
G-K=Sequential number

Product: Zenith Brand TV/TVCR (Orion, Hatzlachh OEM Product)

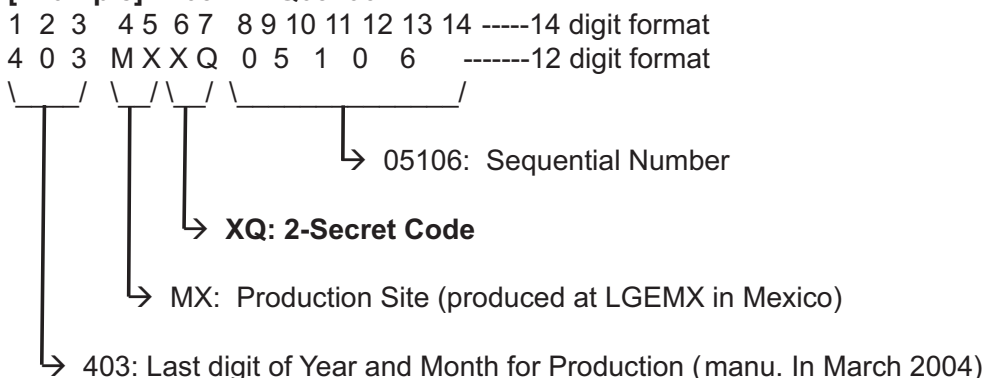
8) EXCEPTION

Model: R5000 (Room Air-Con)

NEW LG SERIAL NUMBER STRUCTURE (2004+)



[Example] 403MXXQ05106



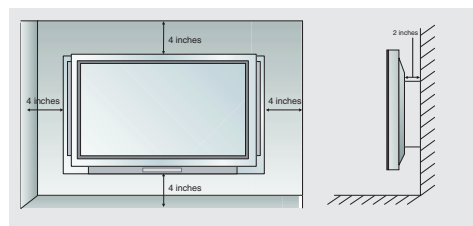
INSTALLATION

GROUNDING

Ensure that you connect the earth ground wire to prevent possible electric shock. If grounding methods are not possible, have a qualified electrician install a separate circuit breaker. Do not try to ground the unit by connecting it to telephone wires, lightening rods, or gas pipes.

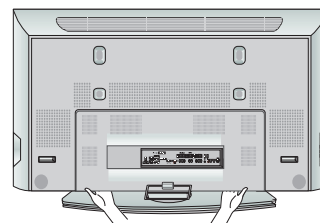
PLACEMENT

The TV can be installed in various ways such as on a wall, or on a desktop etc. Some models can be mounted verically (Portrait) or horizontally (Landscape). Do not mount models that are not denoted as pivot models veritcally. For proper ventilation, allow a clearance of 4 in. on each side and the top, 2.36 in. on the bottom, and 4 in. from the wall.

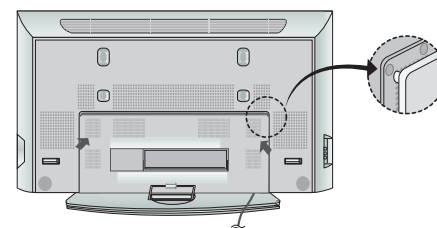


JACKPACK COVER

Some models feature a jackpack cover. Remove the cover by grasping the lower left and right of the cover and then pulling it out.

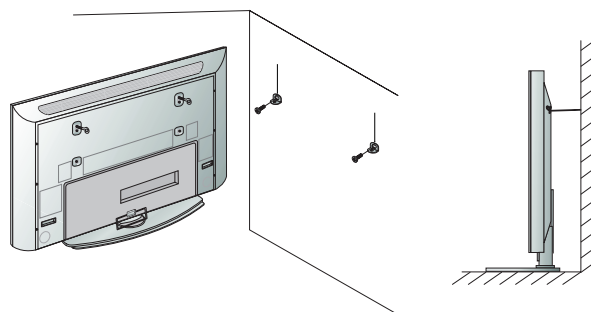


Make the required connections and then replace the cover by aligning the guide to the bushings and press the cover in place with your hand.



ANTI-TIP BRACKETS

If the set will be mounted on a desk top, secure the TV assembly by joining it to a wall by using the included wall brackets. Some models are mounted differently than others, refer to the owners manual for the model you are installing.



INSTALLATION

GENERAL MOUNTING

The chart below gives screw sizes needed to mount our plasma units to most wall mounts. The design of the mount may require longer or shorter screws than the length indicated below. Length is in the far right column. Use 25mm screws for the 42" and 50" plasma models and 15mm for the 60" models. This is subject to change without notice. Some units require spacers between the mount and the unit, this also varies by cabinet design.

Nominal Diameter	Pitch	Root Radius	Pitch Diameter	Minor Diameter		Thread Height		Drill Diameter	Length
d = D	P	r	d2=D2	d3	D1	h3	H1	mm	mm
M 5.00	0.8	0.115	4.48	4.019	4.13	0.491	0.4	4.2	25
M 5.00	0.8	0.115	4.48	4.019	4.13	0.491	0.4	4.2	15

OPERATION

This section covers basic TV functions and operation. Refer to the owners manual for additional information.

NOTE: The DVR (Digital Video Recorder), DCR (Digital Cable Ready) and TV Guide features are not discussed in this section, they each have their own section near the end of this manual.

LANGUAGE

For best results, adjust or confirm adjustment of the **On-Screen Menu Language** first.

1. Press **MENU** on the Remote Control or Front Controls
2. Use the **▲ / ▼** buttons to highlight the **OPTION** Menu (5th Menu) and press **▶**
3. Use the **▲ / ▼** buttons to highlight the **Language** Menu (6th Item) and press **▶**
4. Confirm the desired language selection.

U.S. models incorporate the three North American languages
(English, Spanish, French)

5. If the selected language is not desired, change the language by using the **▲ / ▼** buttons to highlight the desired language setting and press the **ENTER** button to set the language.
6. Press **EXIT** to completely exit the On-Screen Menu or **MENU** to return to the previous menu.

***TIP:** If the language is set to Spanish, the Language Menu will be listed as “Lenguaje”. If the language is set to French, the Language Menu will be listed as “Langue”. The main menu list will not change.*

SETUP MENU

The Setup Menu houses all of the services and options for TV channels and inputs.

EZ SCAN

The *EZ Scan* function will automatically scan for all available over-the-air (OTA) broadcast and/or Cable TV Service channels and adds them to the “Channel Map”. Depending on individual model features, EZ Scan can scan for OTA-NTSC (analog channels from antenna) labeled TV, OTA-ATSC (digital channels from antenna) labeled DTV, CATV (analog Cable TV Service channels), and/or CADTV (digital Cable TV Service channels).

1. Press **MENU** on the Remote Control or Front Controls
2. Use the **▲ / ▼** buttons to highlight the **SETUP** Menu (1st Menu) and press **▶**
3. Use the **▲ / ▼** buttons to highlight **EZ Scan** (1st Item)
4. Press **▶** or **ENTER** to begin the *EZ Scan* process
5. Once the *EZ Scan* is complete, press **EXIT** to completely exit the On-Screen Menu or **MENU** to return to the previous menu.

***NOTE:** If a Cable Box is used to decode CATV channels and output them to the TV via Ch3 or Ch4, the CATV and CADTV channels will not be scanned by the EZ Scan function.*

***NOTE:** If a CableCARD™ is used, CATV and CADTV scans are not performed by the EZ Scan function. CATV and CADTV channels are added to the “Channel Map” via the CableCARD™.*

OPERATION

TIP: The EZ Scan function will re-add previously deleted channels to the “Channel Map”. In order to maintain Channel Map preferences, the manual scan option should be used for individual channel additions.

MANUAL SCAN

The Manual Scan option allows users to manually add channels to the “Channel Map” without having to perform a complete scan.

1. Press **MENU** on the Remote Control or Front Controls
2. Use the ▲ / ▼ buttons to highlight the **SETUP** Menu (1st Menu) and press ►
3. Use the ▲ / ▼ buttons to highlight **Manual Scan** (2nd Item)
4. Use the ► or **ENTER** buttons to enter the Manual Scan function
5. Use the ▲ / ▼ buttons to select the channel type (TV/DTV/CATV/CADTV)
6. Use the ► button to move to the channel number field
7. Use the ▲ / ▼ buttons to select the channel number
8. Press the **ENTER** button to save the channel.
9. Press **EXIT** to completely exit the On-Screen Menu or **MENU** to return to the previous menu.

NOTE: Input physical channel numbers instead of virtual channel numbers. (For Example, WXYZ may broadcast NTSC on Ch 5 and ATSC on Ch 9. Even though the ATSC broadcast appears as Ch 5-1, 5-2, etc., the physical channel number is Ch 9 while the virtual channel assignment or “5” is carried in the PSIP data.)

CHANNEL EDIT

The Channel Edit feature allows users to specify channel usage. Users may add or delete channels from the Channel Map. (The add function primarily operates on channels that have already been added to the Channel map and previously deleted. Use the Manual Scan function to add a new channel.) Users may also create a Favorite Channel Map by using the Channel Edit feature and marking specified channels “FAV”.

1. Press **MENU** on the Remote Control or Front Controls
2. Use the ▲ / ▼ buttons to highlight the **SETUP** Menu (1st Menu) and press ►
3. Use the ▲ / ▼ buttons to highlight **Channel Edit** (3rd Item)
4. Use the ► or **ENTER** buttons to enter the Channel Edit function
5. Use the ▲ / ▼ / ◀ / ▶ buttons to select a channel number
6. To Add / Delete a channel, press the **ENTER** button
7. To mark or remove a channel from the Favorite Channel Map, press the **FAV** button
8. Press **EXIT** to completely exit the On-Screen Menu or **MENU** to return to the previous menu.

TIP: To switch between channel types, TV, CATV, DTV, CADTV, move to the top of the window and select the tab that corresponds with the desired channel type.

DTV SIGNAL STRENGTH

The DTV Signal Strength functions displays a bar meter showing the current strength of the incoming ATSC signal. This feature only applies to digital channel reception and is not available for NTSC channels. This feature is designed to aid in antenna placement and alignment for ATSC reception.

1. Press **MENU** on the Remote Control or Front Controls.
2. Use the **▲ / ▼** buttons to highlight the **SETUP** Menu (1st Menu) and press **▶**
3. Use the **▲ / ▼** buttons to highlight **DTV Signal** (4th Item).
4. Use the **▶** or **ENTER** buttons to display the DTV Signal Meter.
5. Press **EXIT** to completely exit the On-Screen Menu or **MENU** to return to the previous menu.

TIP: You may also display the DTV Signal Meter by pressing the **SIGNAL** button on the Remote Control.

CHANNEL LABEL

The Channel Label feature allows users the ability to assign a network logo to individual channels.

1. Press **MENU** on the Remote Control or Front Controls.
2. Use the **▲ / ▼** buttons to highlight the **SETUP** Menu (1st Menu) and press **▶**.
3. Use the **▲ / ▼** buttons to highlight **Channel Label** (5th Item).
4. Use the **▶** or **ENTER** buttons to enter the Channel Label Setup Screen.
5. Use the **Channel Up / Down** buttons to select the desired channel.
6. Use the **▲ / ▼ / ◀ / ▶** buttons to select the desired logo.
7. Press **ENTER** to assign the logo to the channel.
8. Press **EXIT** to completely exit the On-Screen Menu or **MENU** to return to the previous menu.

NOTE: Not all Network Logos are available. Memory limitations restrict the amount of logos that can be available within the software of the TV.

MAIN INPUT

The Main Input option selects the TV's input (picture source) to be displayed on the screen.

1. Press **MENU** on the Remote Control or Front Controls
2. Use the **▲ / ▼** buttons to highlight the **SETUP** Menu (1st Menu) and press **▶**
3. Use the **▲ / ▼** buttons to highlight **Main Input** (6th Item)
4. Use the **▶** or **ENTER** buttons to enter the Main Input Selection List
5. Use the **▲ / ▼** buttons to highlight the desired input (Antenna, Cable, Video 1, etc)
6. Press **ENTER** to confirm input selection
7. Press **EXIT** to completely exit the On-Screen Menu or **MENU** to return to the previous menu.

SUB INPUT

The Sub Input option selects the input (picture source) to be displayed as Picture-In-Picture (PIP).

1. Press **MENU** on the Remote Control or Front Controls
2. Use the **▲ / ▼** buttons to highlight the **SETUP** Menu (1st Menu) and press **▶**
3. Use the **▲ / ▼** buttons to highlight **Sub Input** (7th Item)
4. Use the **▶** or **ENTER** buttons to enter the Main Input Selection List
5. Use the **▲ / ▼** buttons to highlight the desired input (Antenna, Cable, Video 1, etc.)
6. Press **ENTER** to confirm input selection

OPERATION

7. Press **EXIT** to completely exit the On-Screen Menu or **MENU** to return to the previous menu.

NOTE: *Not all inputs are available for Sub Input at all times. When the Main Input being used is a digital type, the available Sub Inputs are Analog Broadcast, Video, and Front Video. When the Main Input being used is an analog type, the available Sub Inputs are DTV, Analog, Video, and Front Video.*

INPUT LABEL

The Input Label feature allows users to rename the TV's inputs for easier identification.

1. Press **MENU** on the Remote Control or Front Controls
2. Use the **▲/▼** buttons to highlight the **SETUP** Menu (1st Menu) and press **▶**
3. Use the **▲/▼** buttons to highlight **Input Label** (8th Item)
4. Use the **▶** or **ENTER** buttons to enter the Input Label Selection List
5. Use the **▲/▼** buttons to select an input source
6. Use the **▲/▼** buttons to select the input label (VCR, DVD, Set Top Box, Satellite, Cable Box, Game, PC, or *none*)
7. Repeat Steps 5 and 6 to add more input labels
8. Press **EXIT** to completely exit the On-Screen Menu or **MENU** to return to the previous menu.

VIDEO MENU

The Video Menu houses all of the services and options for Picture adjustment.

EZ PICTURE

The EZ Picture option is a series of pre-set values for picture appearance for particular program categories. Typical EZ Picture options include:

Daylight – A bright setting to help compensate for high levels of ambient light normally experienced during daytime hours.

Night Time – A dim setting to help compensate for reduced levels of ambient light normally experienced during nighttime hours.

Normal – An average setting to use as a default setting, or as a starting point for adjustments.

Movie – A setting to enhance the appearance of film based movies.

Video Game – A setting to enhance the appearance of video games.

Sports – A setting to enhance the appearance of sporting events.

TIP: There is an additional setting labeled Custom, which has no preset levels. The Custom setting selects the most recent stored settings from Manual Picture Control.

1. Press **MENU** on the Remote Control or Front Controls
2. Use the **▲/▼** buttons to highlight the VIDEO Menu (2nd Menu) and press **▶**
3. Use the **▲/▼** buttons to highlight EZ Picture (1st Item) and press **▶**
4. Use the **▲/▼** buttons to highlight the desired setting
5. Press **ENTER** to save the selection
6. Press **EXIT** to completely exit the On-Screen Menu or **MENU** to return to the previous menu.

MANUAL PICTURE CONTROL

The Manual Picture Control option allows users to set individual picture controls such as Contrast, Brightness, Color, Tint, Sharpness, and Color Temperature. The Manual Picture Controls should be used to properly set the display once it is in a users home. The environment around the display will affect the perceived quality of the display. For example, the color of the walls and flooring will affect the color levels seen on the display. Also, the amount of ambient light in the room will affect the brightness of the display.

To properly set the Manual Picture Control levels:

1. Make sure the display is in its final place in the room. (If the display is moved to another position, the controls will need to be re-adjusted.)
2. Adjust ambient light. The adjustments should be made for night time movie watching as, this is when consumers are most critical of picture quality. The room should be darkened with little to no ambient light in front of the display. For best results, and to reduce the chance of eye strain, there should be slight ambient light behind the display.
3. Turn off or disable any additional video signal processing such as: XD Engine, Velocity Scan, etc
4. Set EZ Picture to the *Normal* setting.
5. Set Color Temperature to the *Warm* setting.

Contrast – The Contrast control is used to adjust the White Level of the display. The proper setting for contrast is only high enough to allow the difference between white and light gray to be seen. When contrast is set too high, light grays will appear washed out or white, and whites can begin to bloom or over saturate with color (appear slightly blue, pink, or green). When contrast is set too low, whites will appear gray.

To properly set the Contrast Level, lower the contrast setting so that white becomes gray. Next, begin stepping up the contrast level until the lightest gray color becomes white (white and gray sections become one larger section) and then move the control down one step. There should always be a noticeable difference between white and light gray and also note that for best results on all display types (and to reduce display wear) the Contrast Level should be no higher than “85”.

Brightness – The Brightness control is used to adjust the Black Level of the display. The proper setting for brightness is only high enough to allow the difference between black and dark gray to be seen. When brightness is set too high, blacks will appear *washed out* or gray. When brightness is set too low, dark grays will appear black.

To properly set the Brightness Level, begin stepping down the brightness level until the darkest gray disappears into black (at the same time, black and “blacker-than-black” will mix into one. Next, step the brightness level up once so that, black and “blacker-than-black” remain together yet the darkest gray is visible.

NOTE: *The Brightness and Contrast controls interact with each other. The current brightness setting will affect the white level and the current contrast setting will affect the black level. Therefore, you may need to readjust the contrast setting after adjusting the brightness setting, and likewise readjust the brightness setting after subsequent contrast settings. Keep repeating the adjustment until the black and white levels are reached.*

Color – The Color control is used to adjust the Color Saturation of the display. The proper setting for color is to the point where the primary (red, green, & blue) and sub-primary (yellow, cyan, & magenta) colors appear as their pure, natural colors without “bleeding” into other colors. When

OPERATION

color is set too high, predominant colors, such as red, will bloom and bleed, causing white to appear pink, and yellow to appear orange. When color is set too low, the entire image will appear more gray than colored, with the extreme lower limit resulting in a Black & White picture. To properly set the Color Level, lower the color setting to the point where colors begin to appear gray. Next, begin stepping up the color level until the primary and sub-primary colors begin to exceed their normal color representations.

Tint – The Tint control is used adjust the Hue of the display between red or green. The proper setting for tint is, as with the color setting, to the point where the primary (red, green, & blue) and sub-primary (yellow, cyan, & magenta) colors appear as their pure, natural colors without bleeding into other colors. The extreme settings of tint will result in a red/magenta overall hue or a green/cyan overall hue. To properly set the Tint control, adjust towards red if yellows appear with a green tint or towards green if yellows appear with a red or orange tint.

NOTE: *The Color and Tint controls interact with each other. The current color setting will affect the hue and the current tint setting will affect the saturation. Therefore, you may need to readjust the color setting after adjusting the tint setting, and likewise readjust the tint setting after subsequent color settings. Keep repeating the adjustment until the best color representation is reached.*

TIP: *After Color and Tint adjustments are completed, reds may over saturate slightly, causing yellows to appear orange. You may need to slightly reduce the color level to compensate for this effect.*

Sharpness – The Sharpness control is used to adjust the amount of data added to the display image. When the sharpness control is set too high, white or jagged edges will appear on black lines or the edges of objects. When the sharpness control is set too low, the edges of objects or black lines will appear fuzzy. To properly set the Sharpness control, adjust the setting up or down until black lines have crisp, clean edges, while maintaining the overall brightness level across the image.

TIP: *If a noticeable difference is not seen during the sharpness adjustment, simply place the control at the 50 mark.*

1. Press **MENU** on the Remote Control or Front Controls
2. Use the **▲/▼** buttons to highlight the **VIDEO** Menu (2nd Menu) and press **▶**
3. Use the **▲/▼** buttons to highlight the desired control and press **▶**
4. Use the **◀ / ▶** buttons to adjust the control
5. Press **ENTER** to save the selection
6. Use the **▲/▼** buttons to change to another control or
7. Press **EXIT** to completely exit the On-Screen Menu or **MENU** to return to the previous menu.

Color Temperature – The Color Temperature control is used to adjust the color of gray on the display between red and blue tint. The Cool setting will provide a slightly blue tint to the picture. The Warm setting will provide a slightly red tint to the picture. Once the previous adjustments have been made, the color temperature may be changed for personal preference.

Video Reset

The Video Reset option will revert all video menu options to their factory preset values. The EZ Picture function will revert to the *Daylight* setting and the custom settings are the same as Normal.

AUDIO MENU

The Audio Menu provides access to all of the services and options for Sound adjustment.

AUDIO LANGUAGE

The Audio Language setting allows a default language to be specified for any digital broadcasts that might have alternate audio languages.

1. Press **MENU** on the Remote Control or Front Controls
2. Use the **▲/▼** buttons to highlight the **AUDIO** Menu (3rd Menu) and press **▶**
3. Use the **▲/▼** buttons to highlight **Audio Language** (1st Item) and press **▶**
4. Use the **▲/▼** buttons to select a default audio language
5. Press **ENTER** to save the selection
6. Press **EXIT** to completely exit the On-Screen Menu or **MENU** to return to the previous menu.

EZ SOUNDRITE

The EZ SoundRite option prevents the audio level of television commercials from exceeding the audio level of preceding television programs.

1. Press **MENU** on the Remote Control or Front Controls
2. Use the **▲/▼** buttons to highlight the **AUDIO** Menu (3rd Menu) and press **▶**
3. Use the **▲/▼** buttons to highlight **EZ SoundRite** (2nd Item) and press **▶**
4. Use the **▲/▼** buttons to highlight either **Off** or **On**
5. Press **ENTER** to save the selection
6. Press **EXIT** to completely exit the On-Screen Menu or **MENU** to return to the previous menu.

EZ SOUND

The EZ Sound function is a series of preset audio settings to maximize the sound quality of various program types.

Normal – Factory presets for treble, bass, and front surround

Stadium – Preset values for sporting events

News – Preset values to dialog with little to no background effects

Music – Preset values for musical events

Theater – Preset values for movies

TIP: There is an additional setting labeled **Custom**, which has no preset levels. The Custom setting selects the most recent stored settings from Manual Sound Control.

1. Press **MENU** on the Remote Control or Front Controls
2. Use the **▲/▼** buttons to highlight the **AUDIO** Menu (3rd Menu) and press **▶**
3. Use the **▲/▼** buttons to highlight **EZ Sound** (3rd Item) and press **▶**
4. Use the **▲/▼** buttons to highlight the desired setting
5. Press **ENTER** to save the selection
6. Press **EXIT** to completely exit the On-Screen Menu or **MENU** to return to the previous menu.

OPERATION

MANUAL SOUND CONTROL

Balance – The balance control is used to adjust the level of the left and right TV speakers. In normal conditions, the balance control should be set to the middle (even) position. If the main viewing position is not centered with the TV, adjust to balance control so that the speaker farther from the main viewing position is has a higher level.

Treble – The treble control adjusts the level of higher frequencies of the audio spectrum.

Bass – The bass control adjusts the level of lower frequencies of the audio spectrum.

1. Press **MENU** on the Remote Control or Front Controls
2. Use the **▲/▼** buttons to highlight the **AUDIO** Menu (3rd Menu) and press **▶**
3. Use the **▲/▼** buttons to highlight the desired control and press **▶**
4. Use the **◀ / ▶** buttons to adjust the control
5. Press **ENTER** to save the selection
6. Use the **▲/▼** buttons to change to another control or
7. Press **EXIT** to completely exit the On-Screen Menu or **MENU** to return to the previous menu.

FRONT SURROUND

The Front Surround option provides extra processing to mimic surround sound effects using only the TV's 2-channel speakers.

3D EchoSound System – SRS Labs process for improving an incoming mono audio signal to produce a simulated stereo effect. The 3D EchoSound system will also create a three-dimensional sound by creating a wider and deeper sound stage.

SRS TruSurround XT – SRS Labs process for mimicking multi-channel surround sound effect from 2-channels of audio output. The SRS TruSurround XT process can also provide more clarity and bass enrichment to stereo signals.

1. Press **MENU** on the Remote Control or Front Controls
2. Use the **▲/▼** buttons to highlight the **AUDIO** Menu (3rd Menu) and press **▶**
3. Use the **▲/▼** buttons to highlight **Front Surround** (7th Item) and press **▶**
4. Use the **▲/▼** buttons to select the desired setting
5. Press **ENTER** to save the selection
6. Press **EXIT** to completely exit the On-Screen Menu or **MENU** to return to the previous menu.

TV SPEAKER

The TV Speaker selection option is used to either enable or disable the TV's internal speakers. If the TV is connected to a home theater system and there is no desire for audio from the TV's speakers, the TV's speakers may be turned off.

1. Press **MENU** on the Remote Control or Front Controls
2. Use the **▲/▼** buttons to highlight the **AUDIO** Menu (3rd Menu) and press **▶**
3. Use the **▲/▼** buttons to highlight **TV Speakers** (8th Item) and press **▶**
4. Use the **▲/▼** buttons to select the desired setting
5. Press **ENTER** to save the selection

6. Press **EXIT** to completely exit the On-Screen Menu or **MENU** to return to the previous menu.

STEREO / SAP SETUP (NON-MENU OPTION)

This TV can receive both MTS stereo programs and any SAP (Secondary Audio Program) signal that may be present. Pressing the **SAP** buttons on the Remote Control will cycle the TV between three options; Mono, Stereo, and SAP. The Mono and Stereo options will provide audio from the MTS or mono signal present from the broadcaster. The SAP option will provide audio in either another language or another topic only if provided from the broadcaster.

NOTE: *Even though the TV's settings may be either Stereo or SAP, when a mono signal is the only type provided by the broadcaster, mono sound will be heard (unless 3D EchoSound System is selected).*

TIP: *If the incoming signal is very weak, selecting Mono will improve the sound output of a stereo broadcast when the audio is fading in and out.*

TIME MENU

The Time Menu provides access to all of the services and options for Clock and Timer adjustments.

AUTO CLOCK

The Auto Clock option allows the TV's clock to be set automatically via either XDS signals from a PBS broadcaster or from Gemstar's TV Guide On Screen (TVGOS) signal. Non-TVGOS models – Auto Clock will set the clock based on XDS signal from a PBS broadcaster. TVGOS models – Auto Clock will set the clock based on the incoming TVGOS signal.

1. Press **MENU** on the Remote Control or Front Controls
2. Use the **▲/▼** buttons to highlight the **TIME** Menu (4th Menu) and press **▶**
3. Use the **▲/▼** buttons to highlight **Auto Clock** (1st Item) and press **▶**
4. Use the **▲/▼** buttons to select **Off** or **On** and press **▶**
5. If **On** is selected, use the **▲/▼** buttons to select the time zone the TV is located in
6. Use the **▲/▼** buttons to select the Daylight Saving option (Auto, Off, On)
7. Press **ENTER** to save the selection
8. Press **EXIT** to completely exit the On-Screen Menu or **MENU** to return to the previous menu.

MANUAL CLOCK

The Manual Clock option allows direct setting of the TV's clock.

1. Press **MENU** on the Remote Control or Front Controls
2. Use the **▲/▼** buttons to highlight the **TIME** Menu (4th Menu) and press **▶**
3. Use the **▲/▼** buttons to highlight **Manual Clock** (2nd Item) and press **▶**
4. Use the **◀ / ▶** buttons to select **Year**
5. Use the **▲/▼** buttons to set the current year
6. Repeat Steps 4 and 5 to set the date and time
7. Press **ENTER** to save the selection
8. Press **EXIT** to completely exit the On-Screen Menu or **MENU** to return to the previous menu.

OPERATION

NOTE: The Manual Clock option is not available if TVGOS has been setup.

TIMER

The timer functions allow the TV to automatically turn on or off at specified times.

OFF TIMER

1. Press **MENU** on the Remote Control or Front Controls
2. Use the **▲/▼** buttons to highlight the **TIME** Menu (4th Menu) and press **▶**
3. Use the **▲/▼** buttons to highlight **Off Timer** (3rd Item) and press **▶**
4. Use the **▲/▼** buttons to select **Off** or **On** and press **▶**
5. If set to On, use the **▲/▼** buttons to set the hour
6. If set to On, use the **▲/▼** buttons to set the minute
7. Press **ENTER** to save the selection
8. Press **EXIT** to completely exit the On-Screen Menu or **MENU** to return to the previous menu.

ON TIMER

1. Press **MENU** on the Remote Control or Front Controls
2. Use the **▲/▼** buttons to highlight the **TIME** Menu (4th Menu) and press **▶**
3. Use the **▲/▼** buttons to highlight **On Timer** (4th Item) and press **▶**
4. Use the **▲/▼** buttons to select **Off** or **On** and press **▶**
5. If set to On, use the **▲/▼** buttons to set the hour
6. If set to On, use the **▲/▼** buttons to set the minute
7. If set to On, use the **▲/▼** buttons to set the channel for the TV to turn on to
8. If set to On, use the **V** buttons to set the volume for the TV to turn on at
9. Press **ENTER** to save the selection
10. Press **EXIT** to completely exit the On-Screen Menu or **MENU** to return to the previous menu.

NOTE: The TV must be in Stand-by mode for the On function to operate.

TIP: The time must be set before the timer functions can operate.

NOTE: If there is no interaction from a user (any Remote Control or Front Control button) within 2 hours of the TV turning On under the On Timer function, the TV will turn back off. This is a safety measure built into the TV to prevent the TV from accidentally turning on.

SLEEP TIMER

The Sleep Timer function allows the TV to turn off after specified intervals of time.

1. Press **MENU** on the Remote Control or Front Controls
2. Use the **▲/▼** buttons to highlight the **TIME** Menu (4th Menu) and press **▶**
3. Use the **▲/▼** buttons to highlight **Sleep Timer** (5th Item) and press **▶**
4. Use the **▲/▼** buttons to select the desired time interval and press **▶**
5. Press **ENTER** to save the selection
6. Press **EXIT** to completely exit the On-Screen Menu or **MENU** to return to the previous menu.

TIP: Pressing the **SLEEP** button on the Remote Control will also activate the Sleep Timer function. Once activated, each subsequent press of the **SLEEP** button will change the time interval (10, 20, 30, 60, 90, 120, 180, 240 minutes, or off).

AUTO OFF

The Auto Off function, when activated, will automatically turn the TV off if there is no input signal for 10 minutes. This feature is useful when watching DVD Movies or using a Cable TV Box.

1. Press **MENU** on the Remote Control or Front Controls
2. Use the **▲/▼** buttons to highlight the **TIME** Menu (4th Menu) and press **▶**
3. Use the **▲/▼** buttons to highlight **Auto Off** (6th Item) and press **▶**
4. Use the **▲/▼** buttons to select **Off** or **On**
5. Press **ENTER** to save the selection
6. Press **EXIT** to completely exit the On-Screen Menu or **MENU** to return to the previous menu.

OPTION MENU

The Option Menu houses general options and settings for additions control of the TV.

ASPECT RATIO CONTROL (ARC)

The Aspect Ratio Control function adjusts the way that 4:3 programs are displayed.

Set By Program – Disables ARC processing and allows the original aspect ratio of the incoming program to be displayed.

4:3 – Displays 4:3 content without any correction, showing bars on both sides of the picture

16:9 – Displays 4:3 content stretched horizontally, consuming the entire screen

Horizon – Displays 4:3 content stretched only at the sides to consume the entire screen. The center portion of the image is not stretched.

Zoom 1 – Enlarges the overall size of 4:3 content to consume the entire screen without and distortion. However, the upper and lower portions of the image will be cropped.

Zoom 2 – Enlarges the overall size of 4:3 content to a greater extent than Zoom 1

Cinema Zoom – Adjustable enlargement of the Zoom function. (1-16)

1. Press **MENU** on the Remote Control or Front Controls
2. Use the **▲/▼** buttons to highlight the **OPTION** Menu (5th Menu) and press **▶**
3. Use the **▲/▼** buttons to highlight **Aspect Ratio** (1st Item) and press **▶**
4. Use the **▲/▼** buttons to select the desired ARC setting
5. Press **ENTER** to save the selection
6. Press **EXIT** to completely exit the On-Screen Menu or **MENU** to return to the previous menu.

CINEMA 3:2 MODE SETUP

The Cinema 3:2 Mode provides additional process for 480i content (particularly movies) to help reduce the flickering caused during the conversion of 24 fps film to 30fps television signals.

1. Press **MENU** on the Remote Control or Front Controls
2. Use the **▲/▼** buttons to highlight the **OPTION** Menu (5th Menu) and press **▶**
3. Use the **▲/▼** buttons to highlight **Cinema 3:2 Mode** (2nd Item) and press **▶**

OPERATION

4. Use the **▲/▼** buttons to select **Off** or **On**
5. Press **ENTER** to save the selection
6. Press **EXIT** to completely exit the On-Screen Menu or **MENU** to return to the previous menu.

NOTE: Cinema 3:2 Mode only operates in 480i mode.

CAPTION

Closed Captions are included in the NTSC and ATSC television signals to provide text of dialog spoken in the program.

To activate / deactivate Captions:

1. Press **MENU** on the Remote Control or Front Controls
2. Use the **▲/▼** buttons to highlight the **OPTION** Menu (5th Menu) and press **▶**
3. Use the **▲/▼** buttons to highlight **Caption** (3rd Item) and press **▶**
4. Use the **▲/▼** buttons to select **Off** or **On**
5. Press **ENTER** to save the selection
6. Press **EXIT** to completely exit the On-Screen Menu or **MENU** to return to the previous menu.

CAPTION/TEXT

The Caption/Text option is used to select the type (NTSC) or language (ATSC) of captions to be displayed.

Incoming NTSC broadcast signal:

- CC 1** – Closed Captions that are in English and in time with spoken dialog
- CC 2** – Closed Captions that are not required to be in time with spoken dialog
- CC 3** – Closed Captions that are in an alternate language
- CC 4** – Open use, without specifications
- Text 1** – Near full screen Closed Captions in time with spoken dialog
- Text 2** – Near full screen Closed Captions not required to be in time with dialog
- Text 3** – Open use near full screen captions
- Text 4** – Open use near full screen captions

NOTE: Most broadcasts will only include **CC1** and are not required to use any other format.

Incoming ATSC broadcast signal:

- English** – English captions
- Spanish** – Optional Spanish captions
- French** – Option French captions

1. Press **MENU** on the Remote Control or Front Controls
2. Use the **▲/▼** buttons to highlight the **OPTION** Menu (5th Menu) and press **▶**
3. Use the **▲/▼** buttons to highlight **Caption/Text** (4th Item) and press **▶**
4. Use the **▲/▼** buttons to select the desired option
5. Press **ENTER** to save the selection
6. Press **EXIT** to completely exit the On-Screen Menu or **MENU** to return to the previous menu.

CAPTION OPTION

The Caption Option setting is only available when the incoming signal is a DTV broadcast and if the settings within the PSIP signal (provided by the broadcaster) allow alteration of the caption display. When available, the caption text may be altered by size, font, and color.

Size – Set the size of the captions

Font – Set the font of the captions

Text Color – Set the color of the caption text

Text Opacity – Set the opaqueness of the caption text

Background Color – Set the background color of the captions

Background Opacity – Set the opaqueness of the caption's background

Edge Type – Set a border for the captions

Edge Color – Set a color for the caption border

1. Press **MENU** on the Remote Control or Front Controls
2. Use the **▲/▼** buttons to highlight the **OPTION** Menu (5th Menu) and press **▶**
3. Use the **▲/▼** buttons to highlight **Caption Option** (2nd Item) and press **▶**
4. Use the **▲/▼** buttons to select the desired item
5. Use the **◀ / ▶** buttons to set the item option
6. Repeat Steps 4 and 5 to set the edit all of the desired items
7. Press **ENTER** to save the selection
8. Press **EXIT** to completely exit the On-Screen Menu or **MENU** to return to the previous menu.

EZ DEMO

The EZ Demo option demonstrates the available menus of the TV.

1. Press **MENU** on the Remote Control or Front Controls
2. Use the **▲/▼** buttons to highlight the **OPTION** Menu (5th Menu) and press **▶**
3. Use the **▲/▼** buttons to highlight **EZ Demo** (7th Item) and press **▶**
4. Press **EXIT** to stop the demonstration

LOCK MENU

The Lock Menu allows change of of the Parental Controls / V-Chip settings for the TV to block specific channels, ratings and/or inputs. The Parental Control function blocks programs based on the ratings sent by the broadcaster. The default setting allows all programs to be viewed. To use this functions, the following must be performed:

1. Set ratings and categories to be blocked
2. Set a Parental Control password
3. Enable the locking system

TO ENTER WHILE LOCKED:

1. Press **MENU** on the Remote Control or Front Controls
2. Use the **▲/▼** buttons to highlight the **LOCK** Menu (6th Menu) and press **▶**
3. Enter the password (0000 is the default password)

OPERATION

4. Use the **▲/▼** buttons to highlight the desired system and press **▶**
5. Use the **▲/▼** buttons to set the desired blocking
6. Press **ENTER** to save the selection
7. Press **EXIT** to completely exit the On-Screen Menu or **MENU** to return to the previous menu.

TIP: If the password is forgotten, “7777” will reset it.

MOVIE RATING SYSTEM

G – General audience (all ratings below are blocked)

PG – Parental guidance suggested (all ratings below are blocked)

PG-13 – Parents strongly cautioned (all ratings below are blocked)

R – Restricted (all ratings below are blocked)

NC-17 – No one 17 and under admitted (all ratings below are blocked)

X – Adult only

Blocking Off – Permits all programs

TELEVISION RATING SYSTEM

TV-G – General audience

TV-PG – Parental guidance suggested

TV-14 – Parents strongly cautioned

TV-MA – Mature audience only

TV-Y – All children

TV-Y7 – Children 7 years and older

TV RATING CHILDREN (OPTION – SETTING)

Age – TV-Y and TV-Y7

Fantasy Violence – TV-Y7

TV RATING GENERAL (OPTION – SETTING)

Age – TV-G TV-PG TV-14 TV-MA

Dialog (sexual dialog) – TV-PG TV-14

Language (adult language) – TV-PG TV-14 TV-MA

Sex (sexual situations) – TV-PG TV-14 TV-MA

Violence – TV-PG TV-14 TV-MA

INPUT BLOCK (DISABLES EXTERNAL INPUTS)

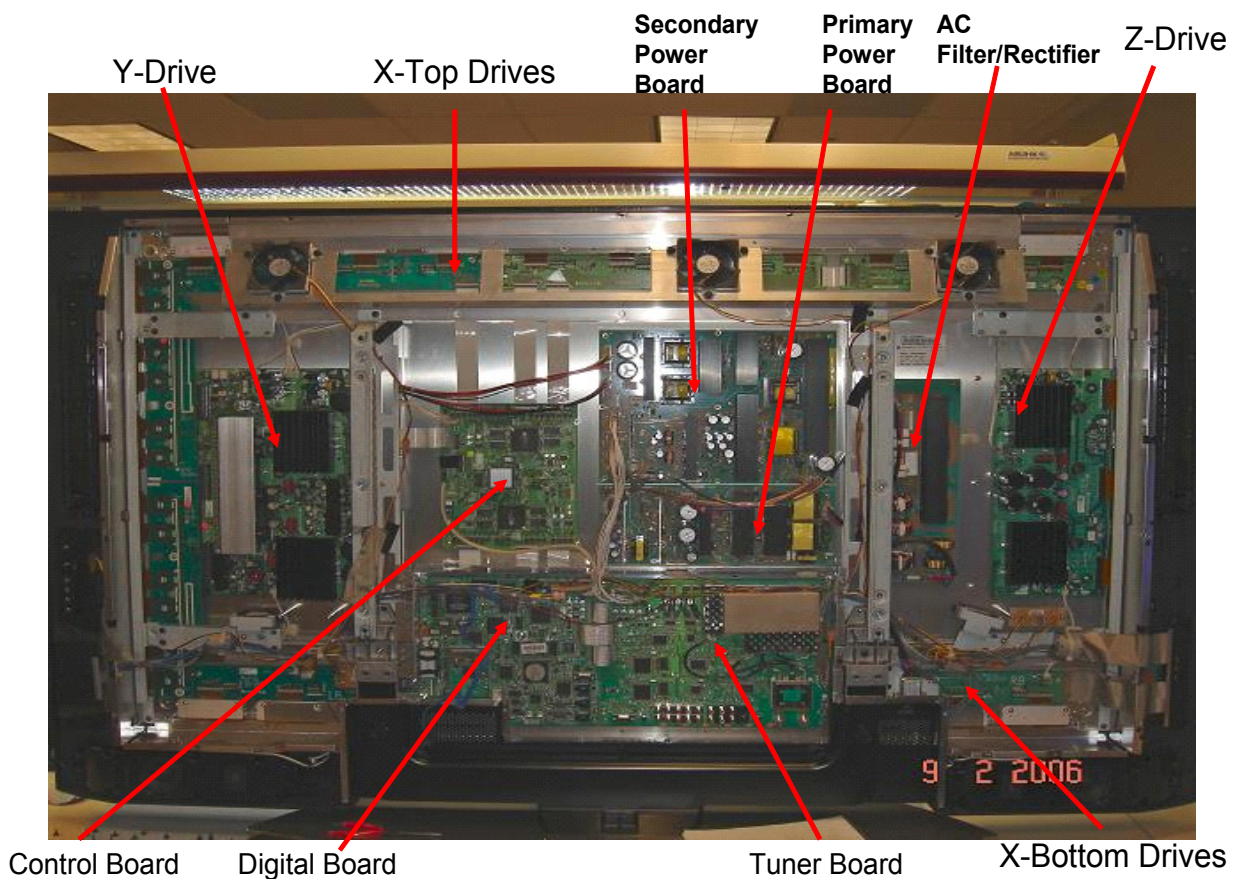
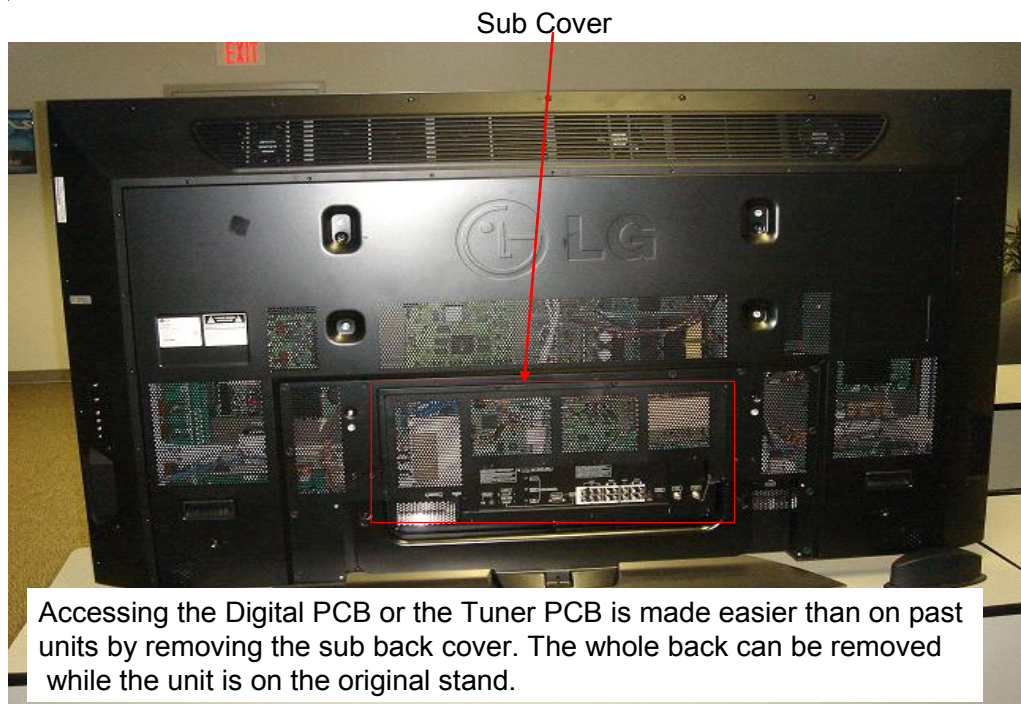
Video1, Video 2, Front Video

Component 1, Component 2

RGB, HDMI1/DVI, HDMI2

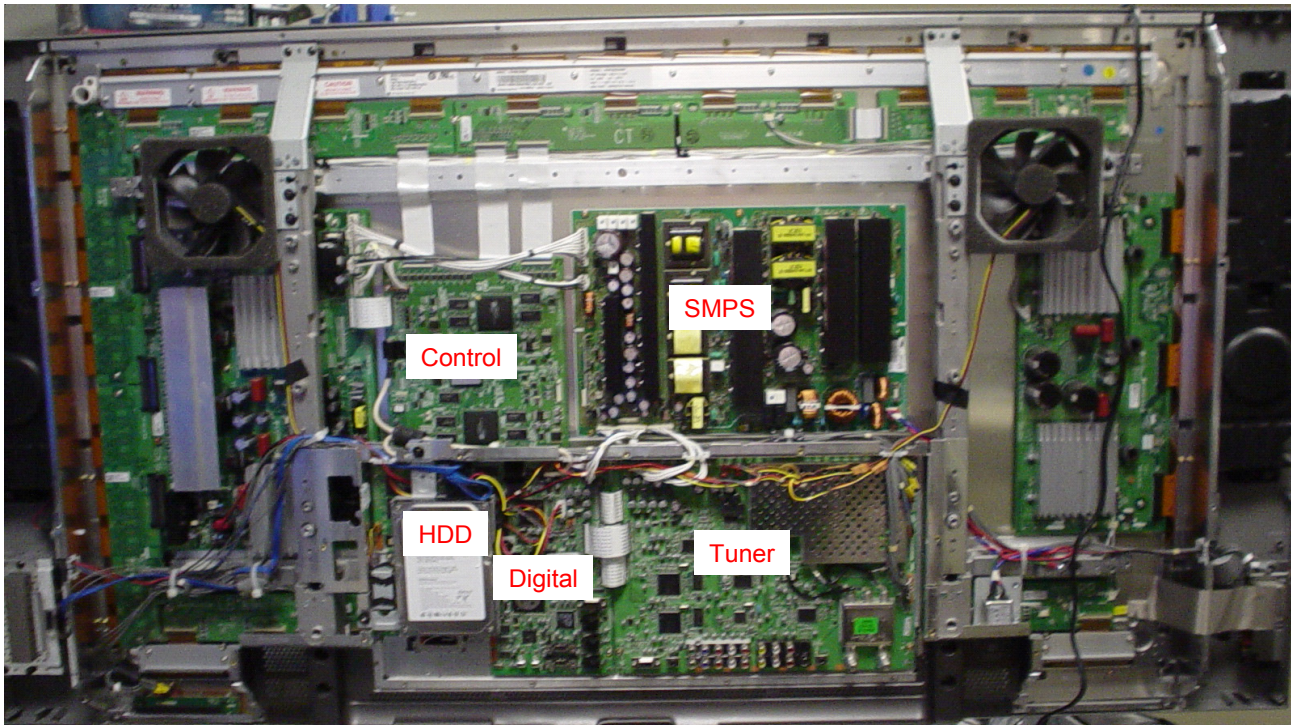
PCB LAYOUT

60PY2DR LAYOUT

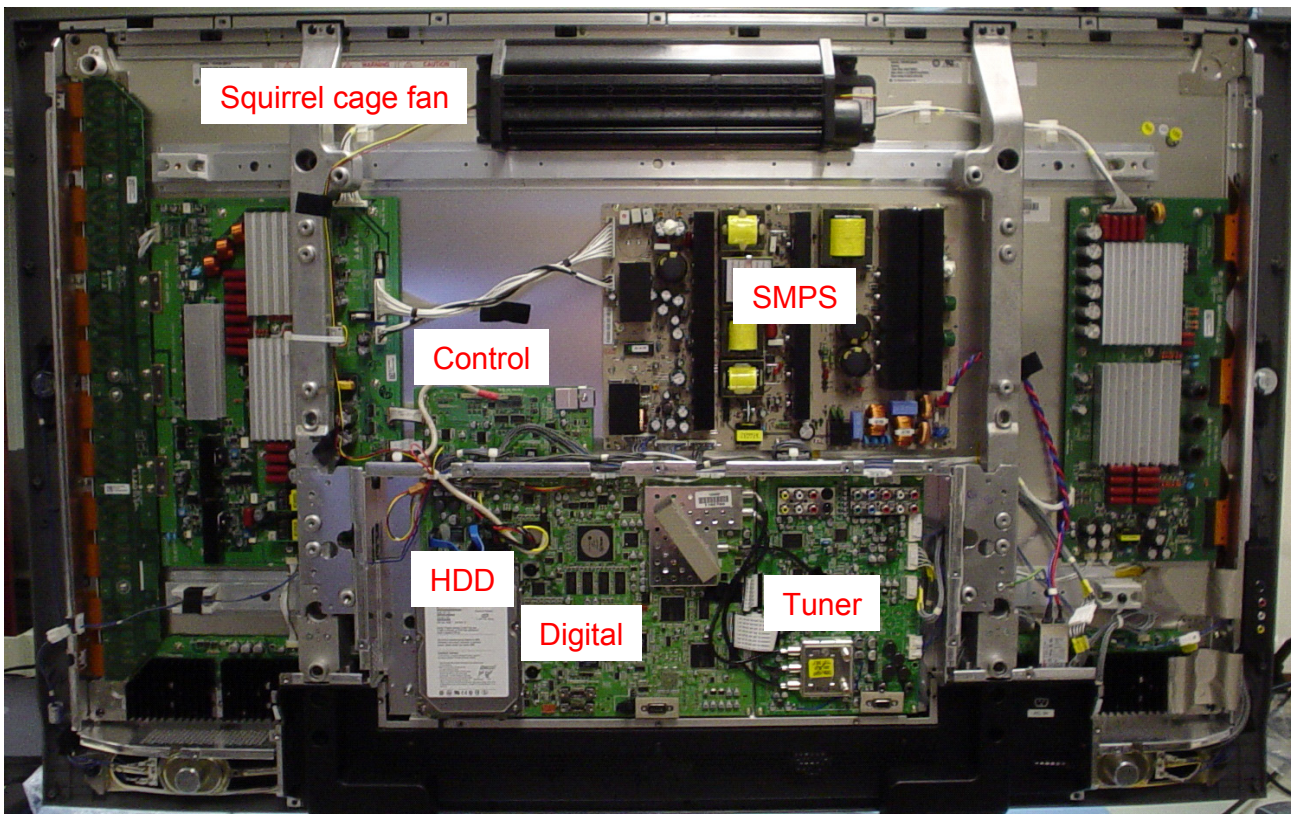


CIRCUIT DESCRIPTIONS

50PX4DR LAYOUT



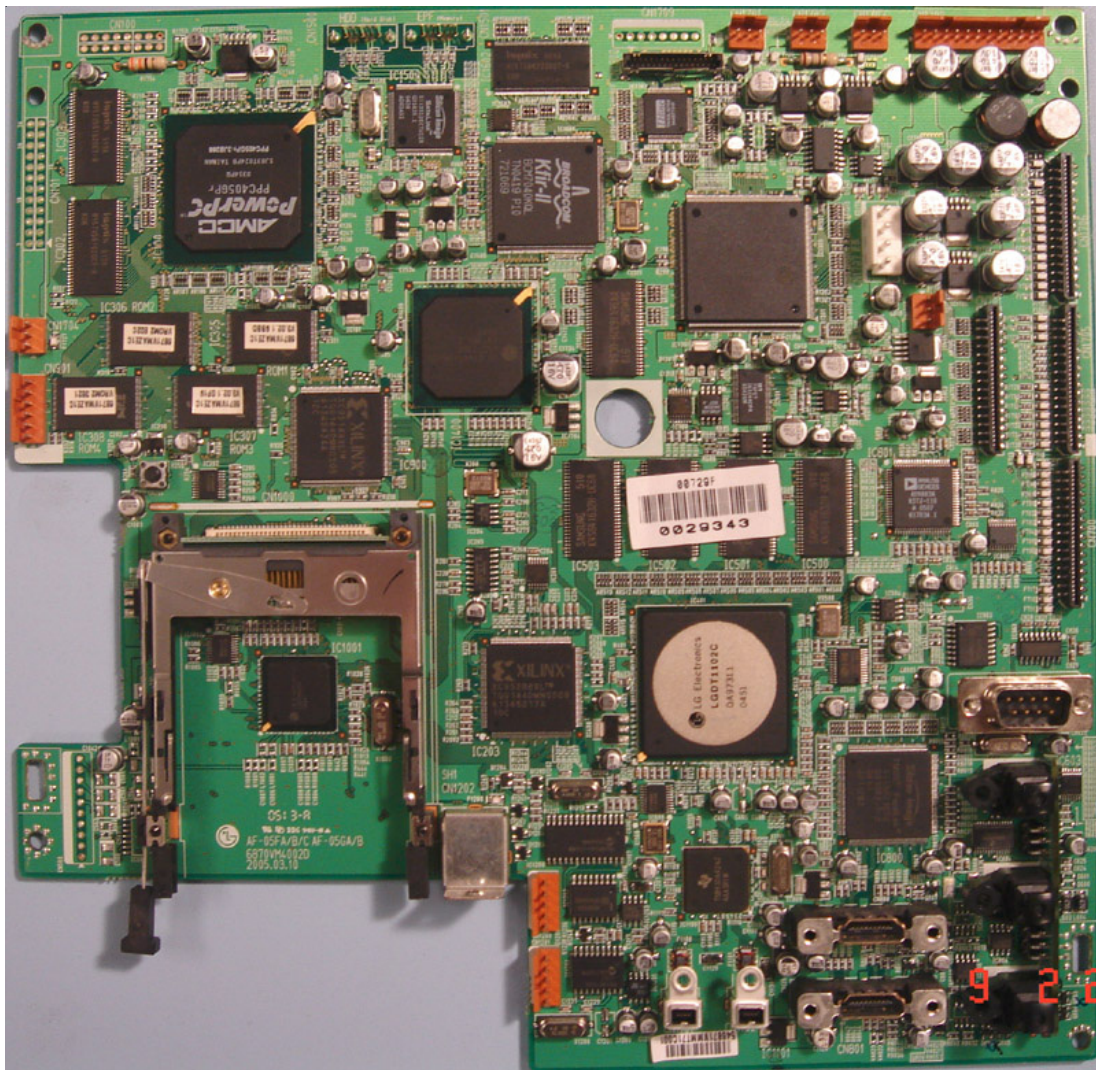
50PC1DR LAYOUT



NOTE: This fan does not startup when the unit is powered on from a cold start for 2-3 minutes.

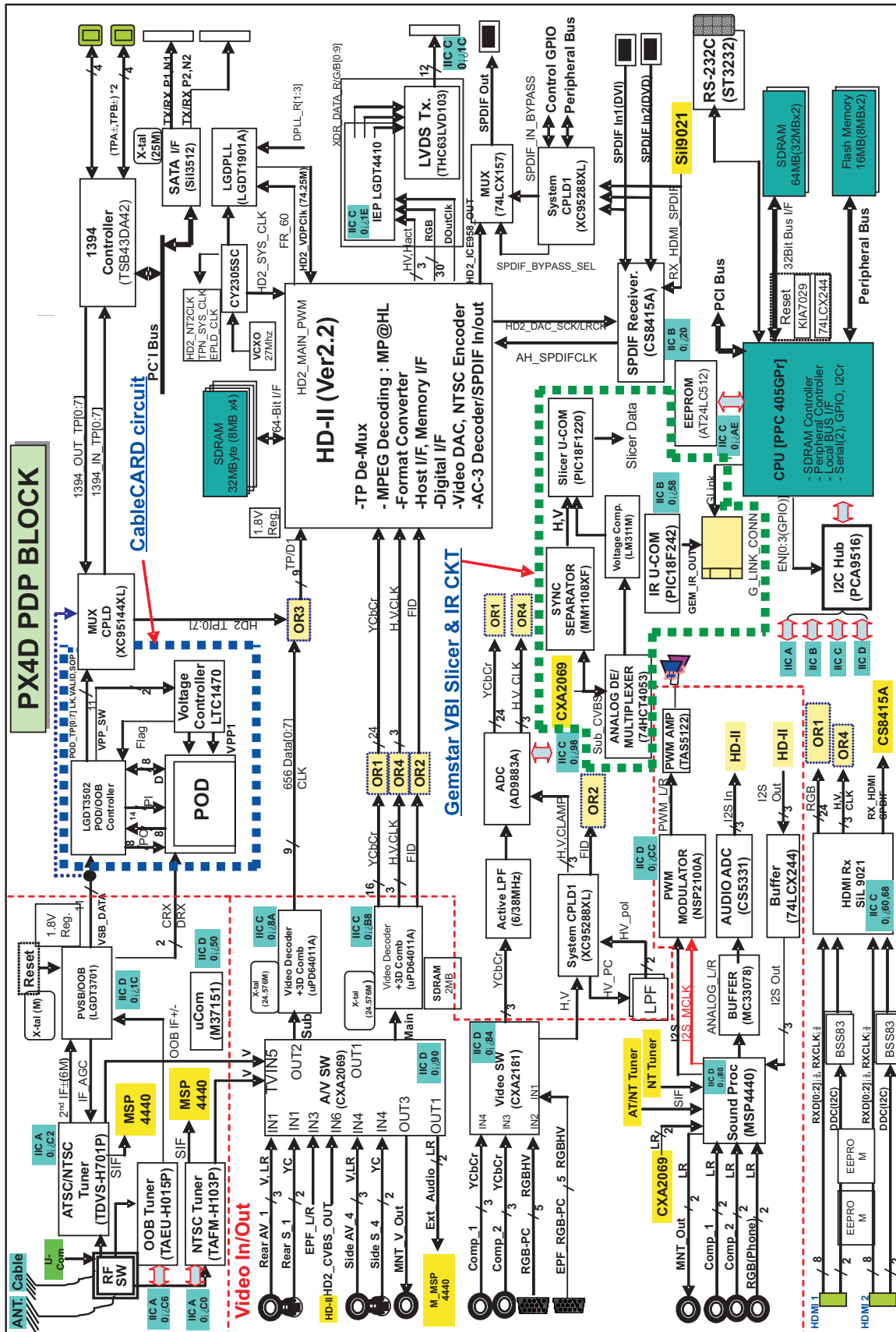
DIGITAL PCB

The digital board below is from the 60PY2DR, other models may differ slightly.



The digital PCB provides Digital Signal Processing (dsp) and controls the state of each FET on each DRIVER B/D with R, G, B, each with 8bit input. This board contains the Cablecard slot and supporting buffers which are shared with the Cablecard while it is in operation due to the data flow from the cable headend to the card. This data flow constantly updates the channel list and the CP (Copy Protect) data and the channel authorization list and the encryption and descramble data. This is done every ten to twenty seconds. This PCB also is host to the HDD (Hard Disk Drive) control circuit. This circuit will recognize the HDD if it is programmed and formatted correctly. These drives are setup especially for this function, thus a drive from another vender will not function in this unit. This is done for CP (Copy Protect) reasons. If the HDD is suspect of errors or video issues, power down the unit and remove A/C and disconnect the IDE cable and power the unit back on. If the problem still exists, the problem is not on the HDD. The unit can be used without the HDD connected. In this situation the unit will function normally except any function related to the HDD or demo mode which is stored on the HDD. This PCB also contains all of the Digital inputs. The analog to digital conversion is done on this PCB as well.

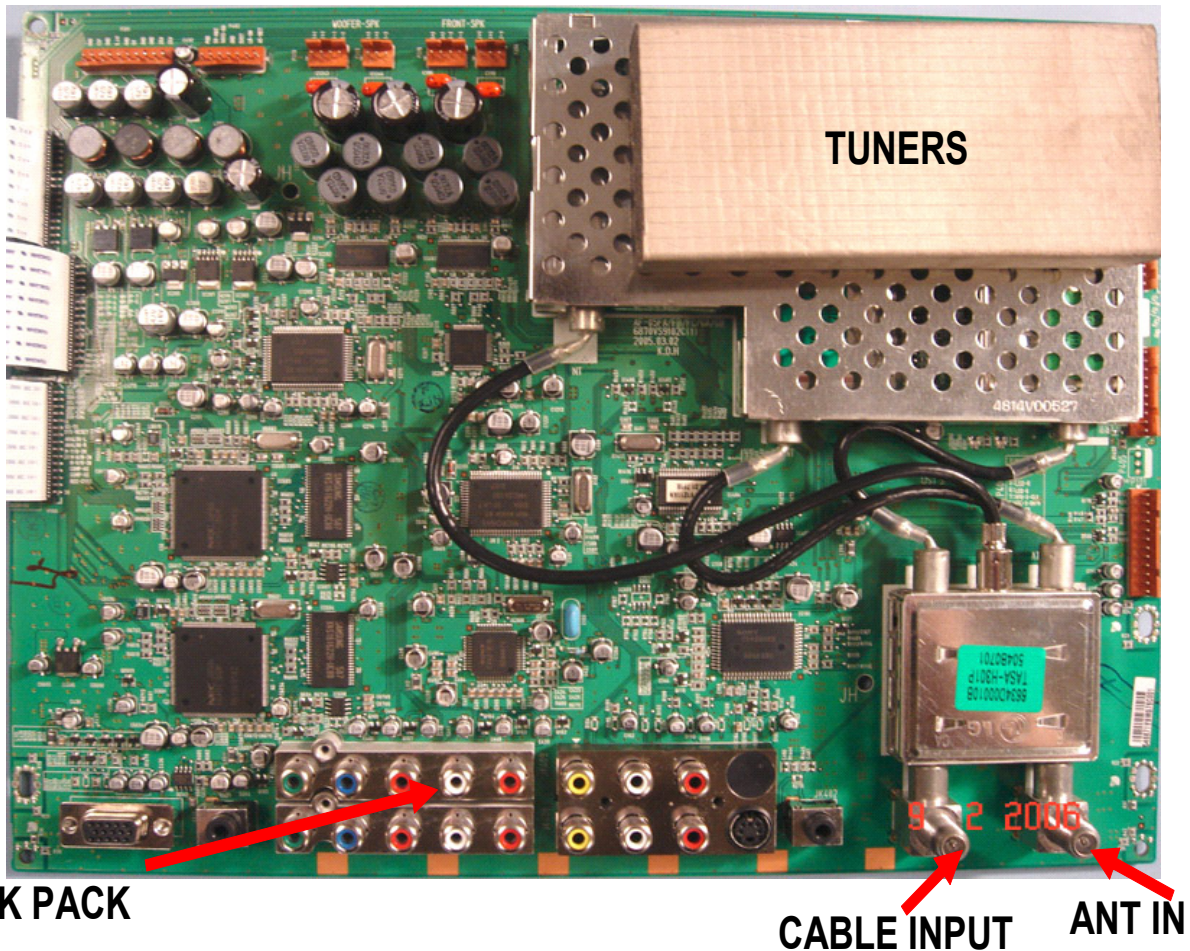
CIRCUIT DESCRIPTIONS





CIRCUIT DESCRIPTIONS

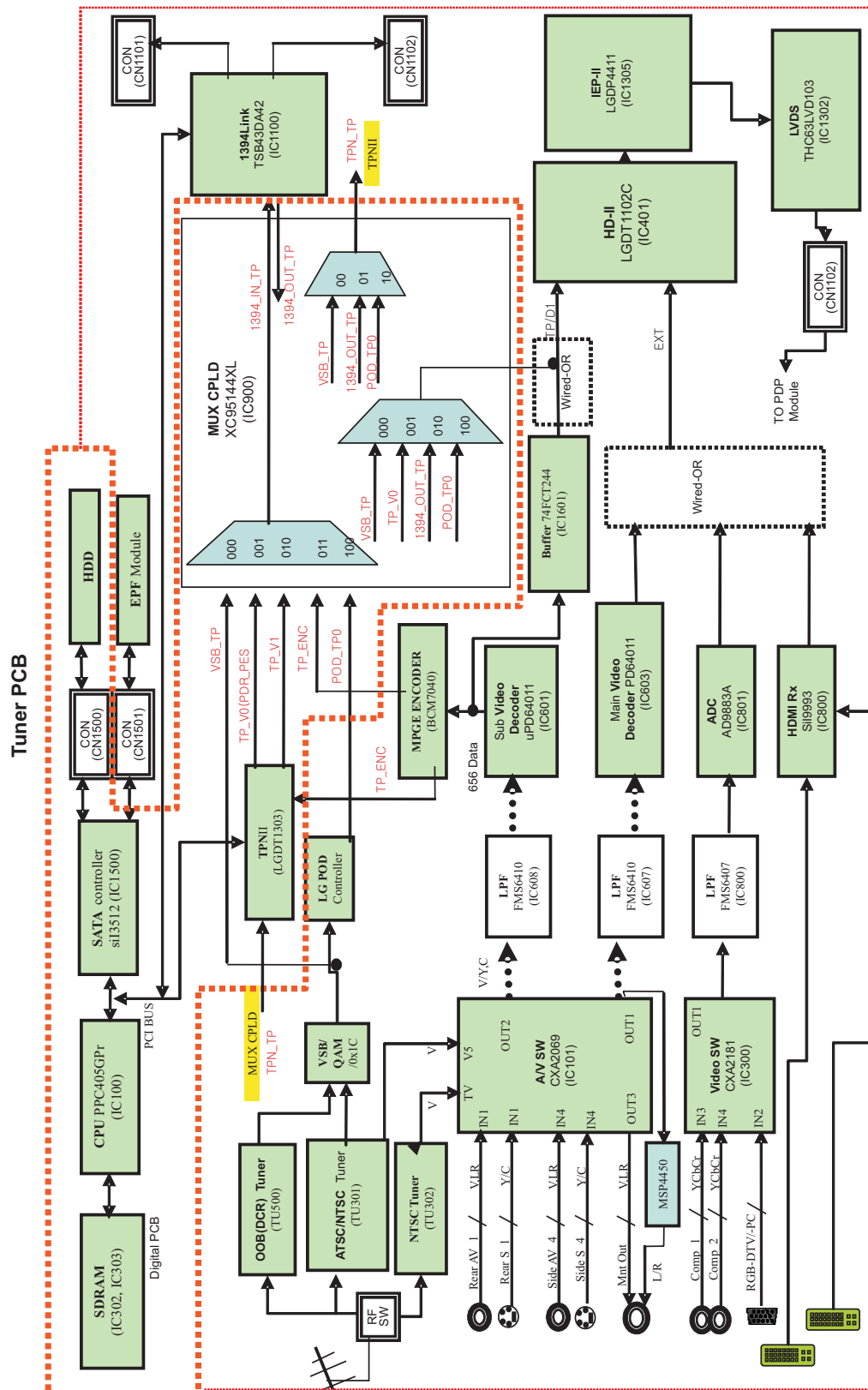
TUNER PCB



A tuner is a device to adjust the resonant frequency of an antenna or transmission line to work most efficiently at one frequency or band of frequencies. Most tuners do all the low level demodulation needed to convert a radio signal into an on-screen image using a hardware DSP chip or ASIC; some also have hardware MPEG decoders. This PCB contains three tuners, one OOB (Out Of Band), one digital tuner, and an analog tuner.

NOTE: *The RCA cables connecting the tuner to the RF adapter do NOT come with PCB replacements. They must be removed from the original PCB and connected properly to deliver the correct signal to the correct tuner.*

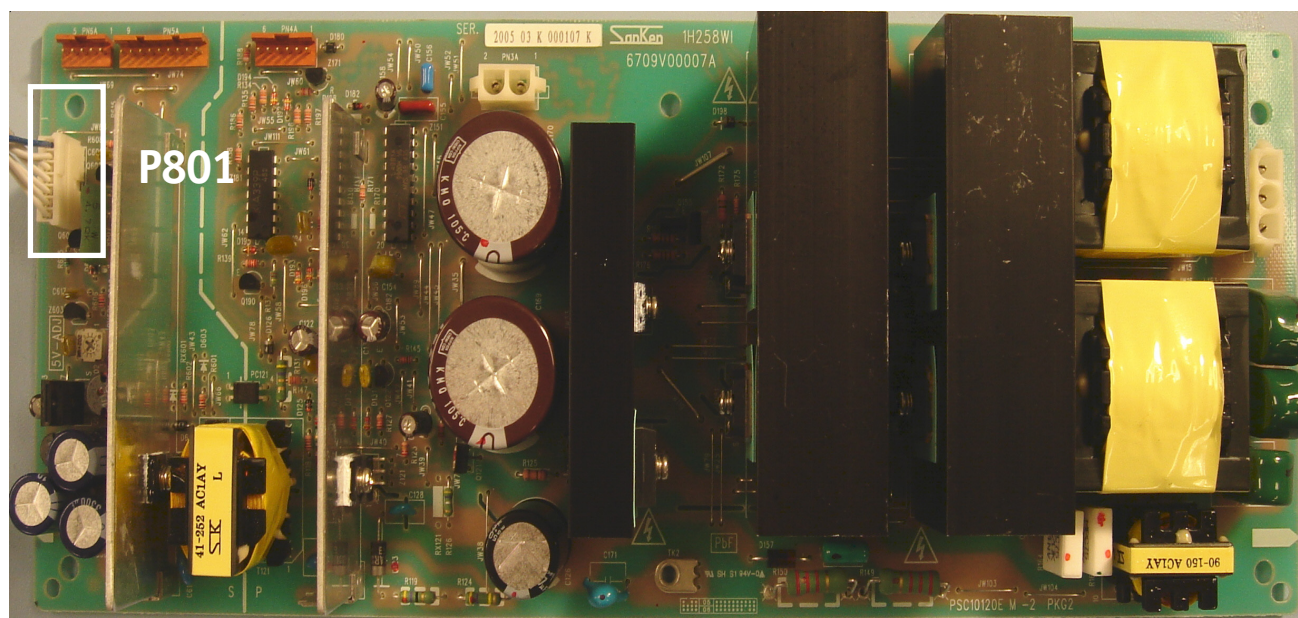
NOTE: *The ribbon cables seen in the upper left connect this PCB to the Digital PCB and will tear or crease easily. A tear or crease can easily lead to a misdiagnosis. If these cables become creased or damaged in any way. Test them with an ohm meter to check each conductor for continuity.*



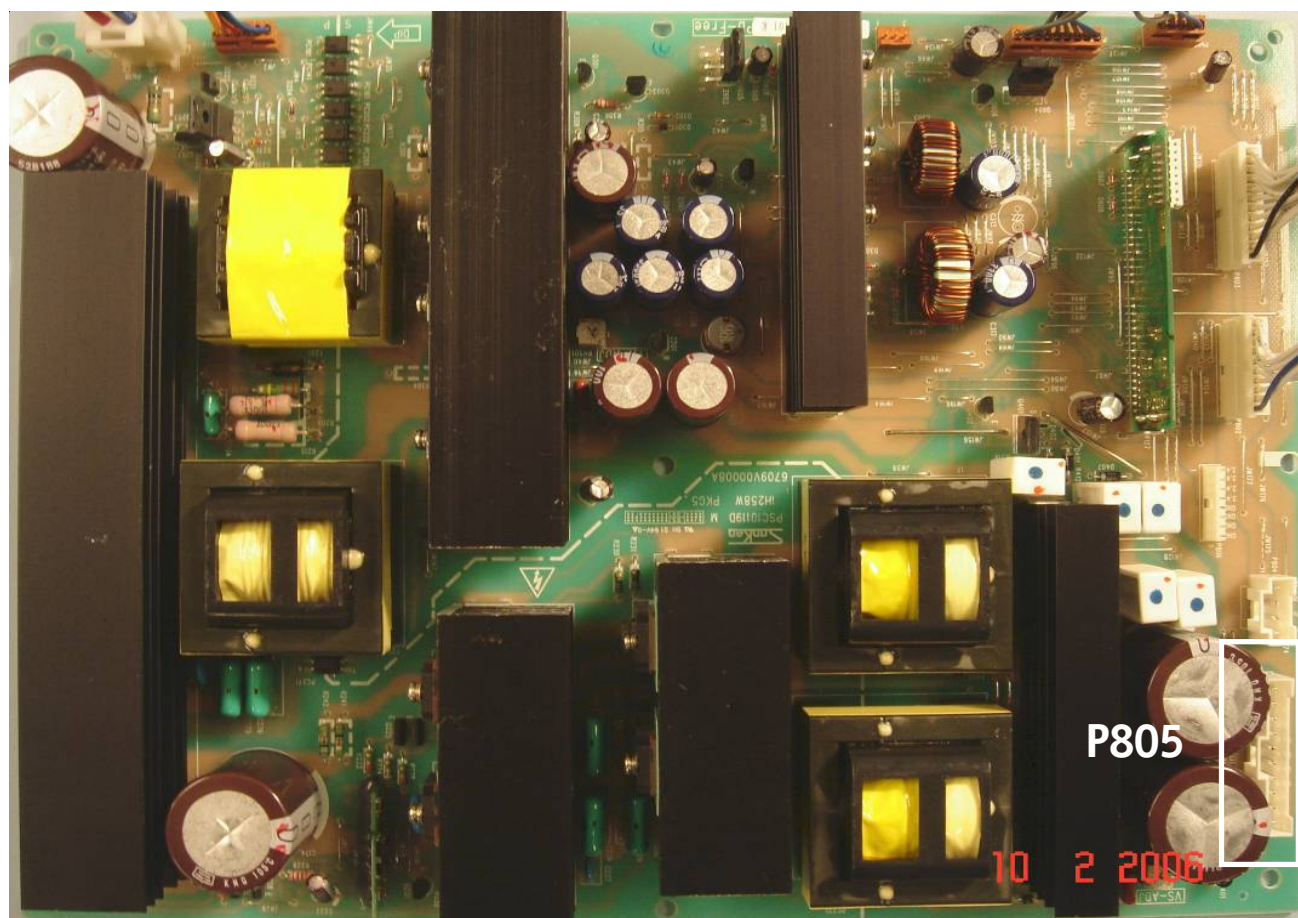
CIRCUIT DESCRIPTIONS

POWER SUPPLY

MAIN STANDBY SMPS 60PY2DR

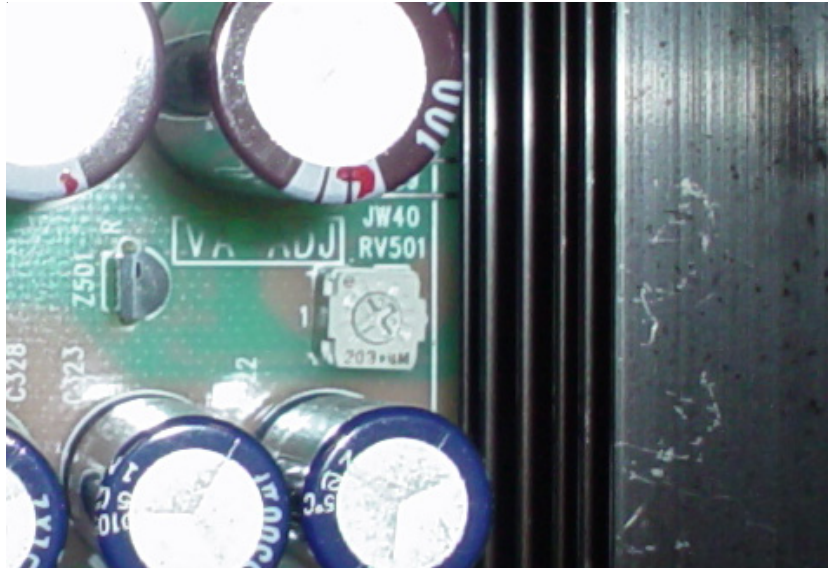


MAIN SMPS PCB 60PY2DR



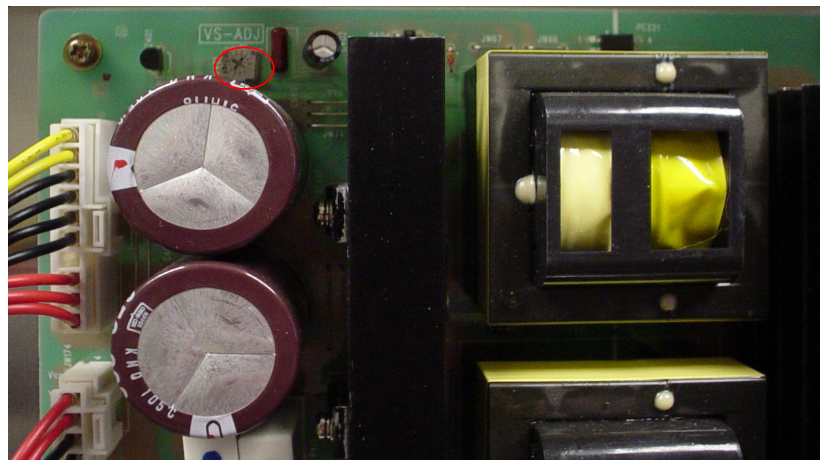
VA ADJUSTMENT 60PY2DR

The VA adjustment on the main SMPS has no designated test point. The DVM will have to be connected to P805 pin 9 or 10 and the negative lead to chassis ground. Refer to the panel label for the correct setting.



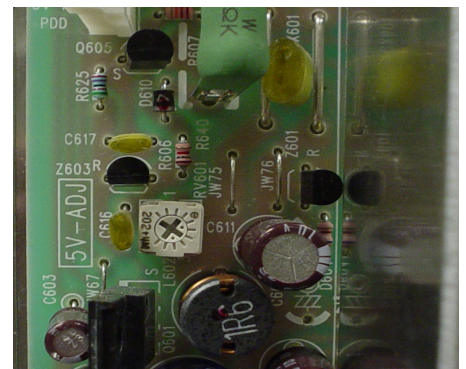
VS ADJUSTMENT 60PY2DR

VS adjustment also has no dedicated test point. Use P805 pins 1, 2, or 3 and connect the negative probe from a DVM to chassis ground. Refer to the panel label for the correct setting.



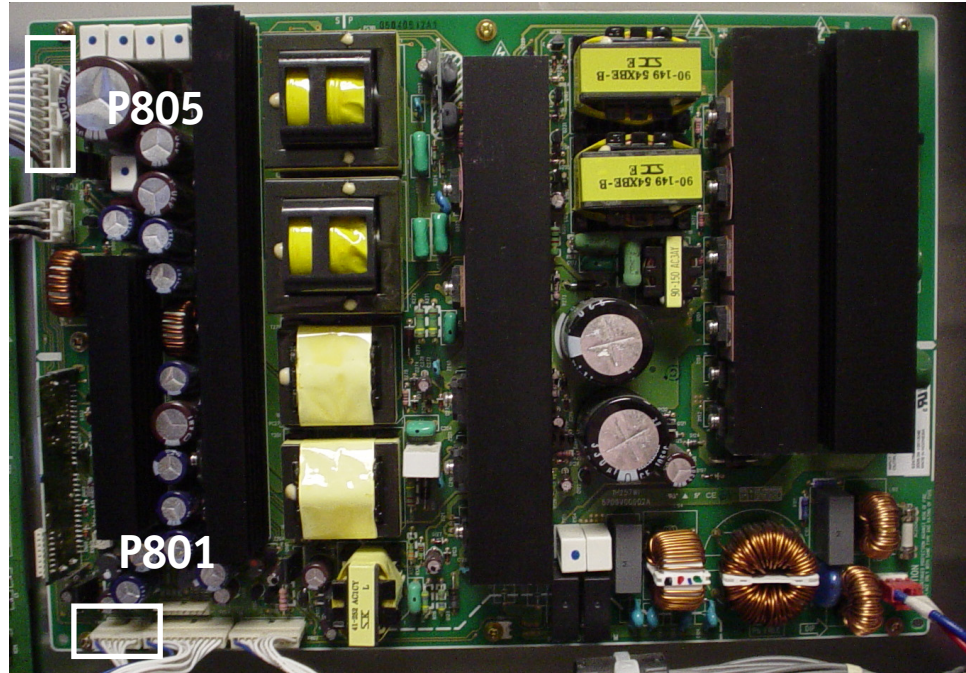
5V ADJUSTMENT 60PY2DR

This 5V adjustment can be tested on P801 pin 5 to chassis gnd.



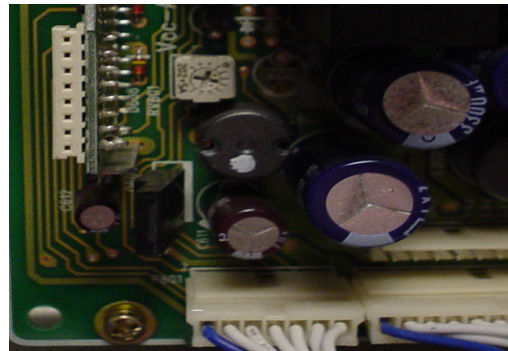
CIRCUIT DESCRIPTIONS

50PX4DR SMPS



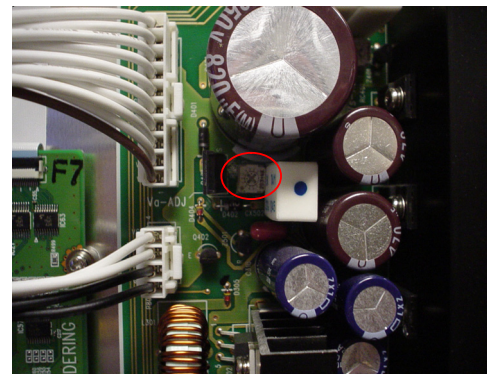
50PX4DR SMPS ADJUSTMENTS

VCC Adjustment to adjust StandBy voltages at P801

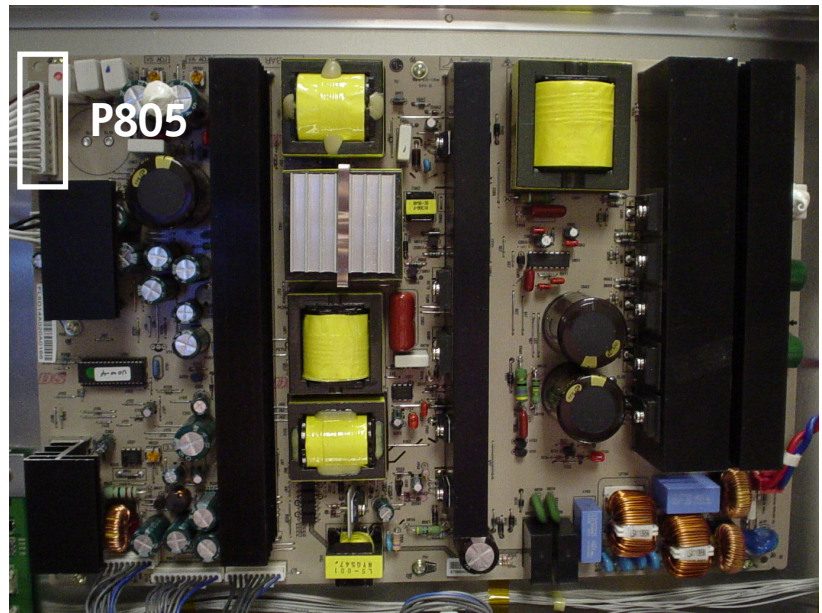


VA ADJUSTMENT 50PX4DR

VA adjustment use P805 pin 9 or 10 and chassis ground to test

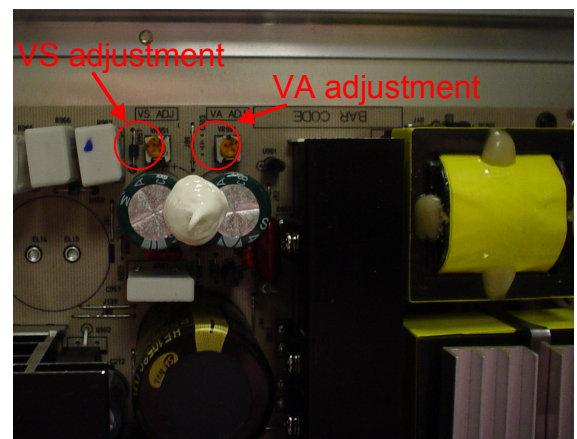


50PC1DR SMPS

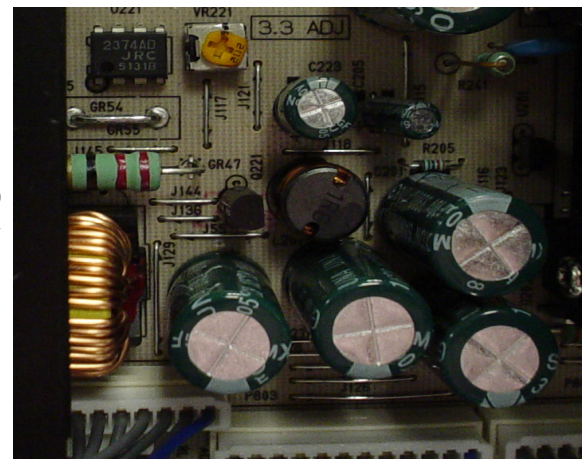


50PC1DR SMPS ADJUSTMENTS

Test points are from P805 pin 8, 9 or 10 for VS to chassis ground. For VA, P805 pin 1 or 2 to chassis ground. Refer to the panel label for the correct settings.

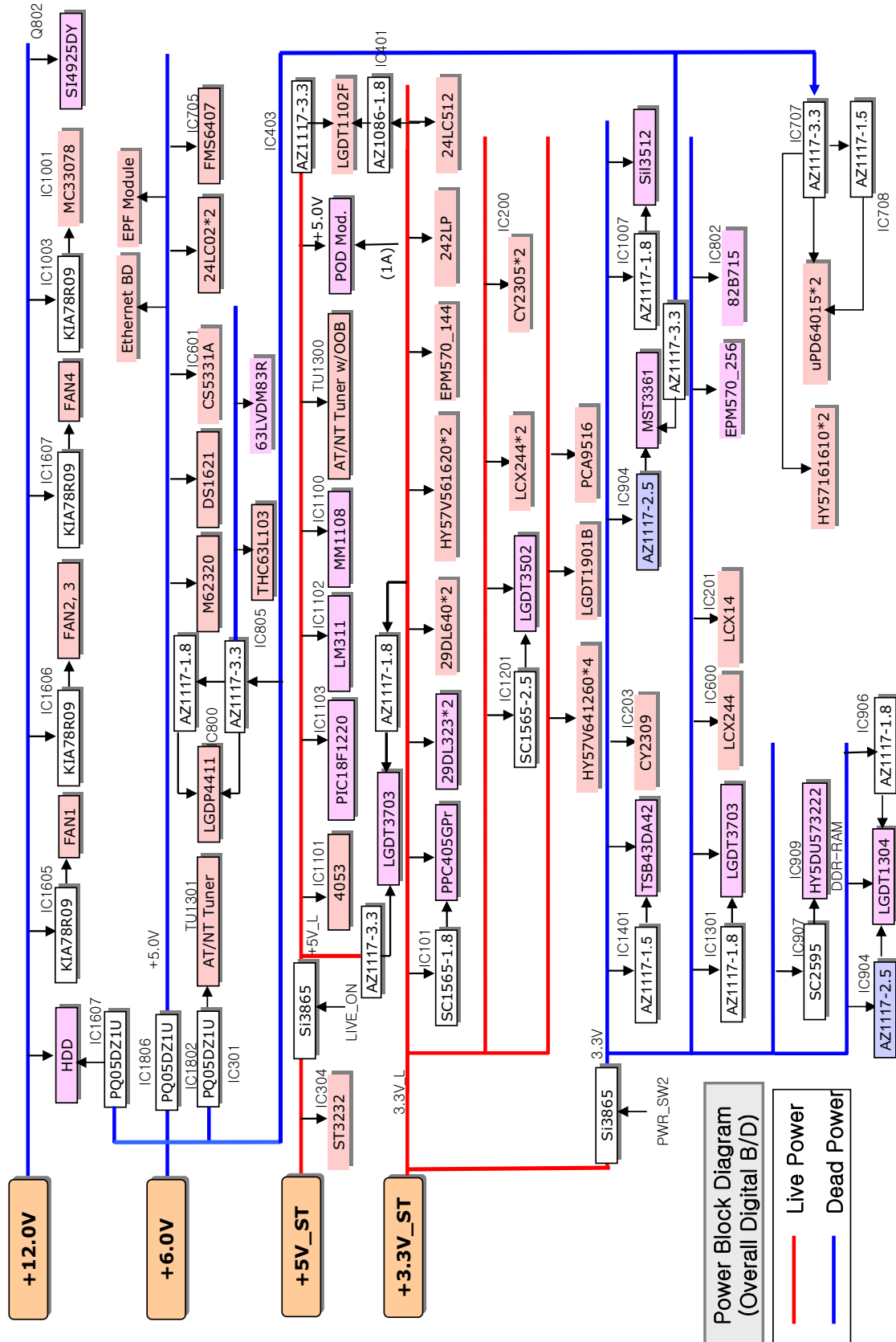


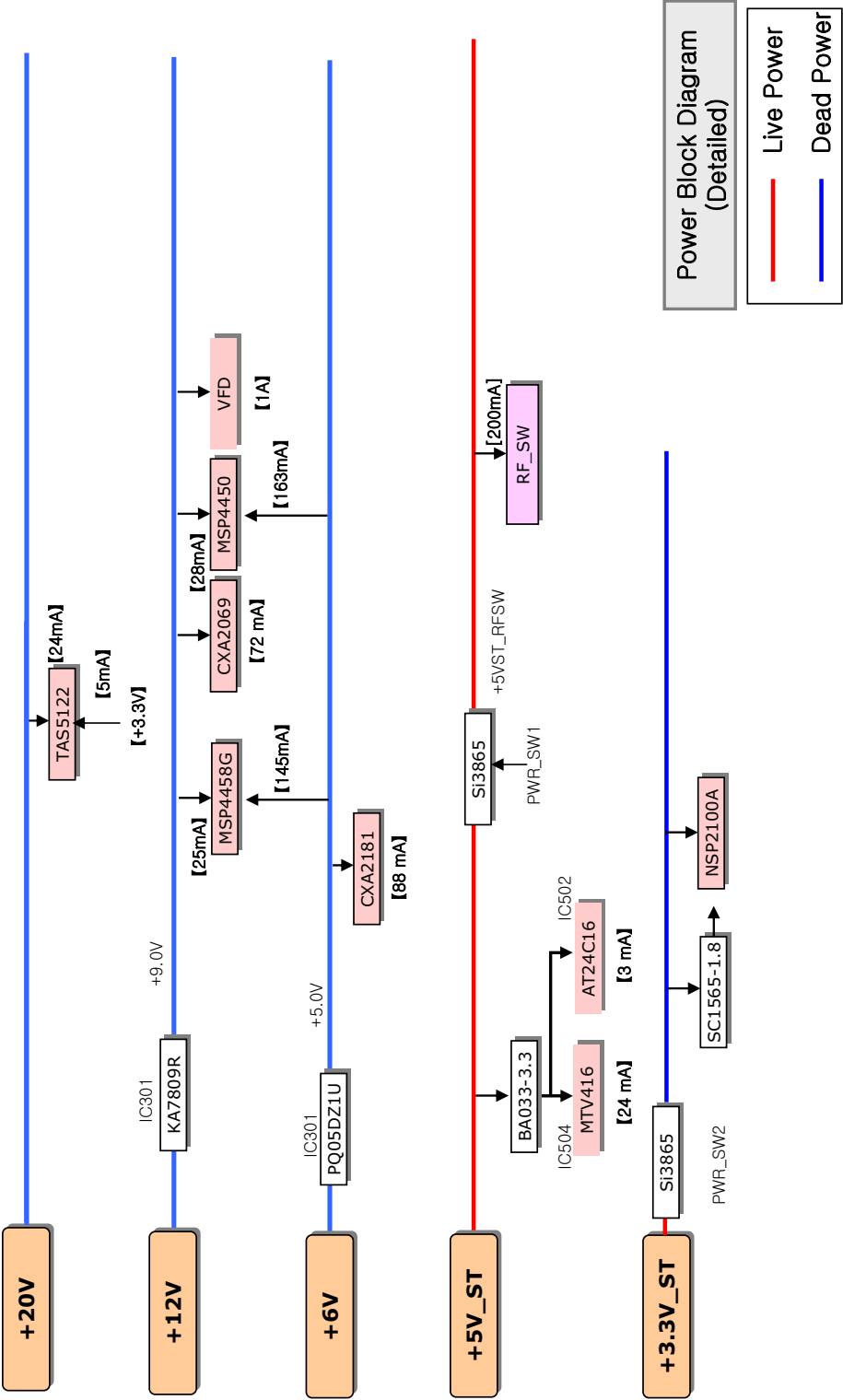
This 3.3VDC is supplied for the cablecard and micro processors in this unit. Test point is P803 pin 1 using chassis ground for reference to ground.



CIRCUIT DESCRIPTIONS

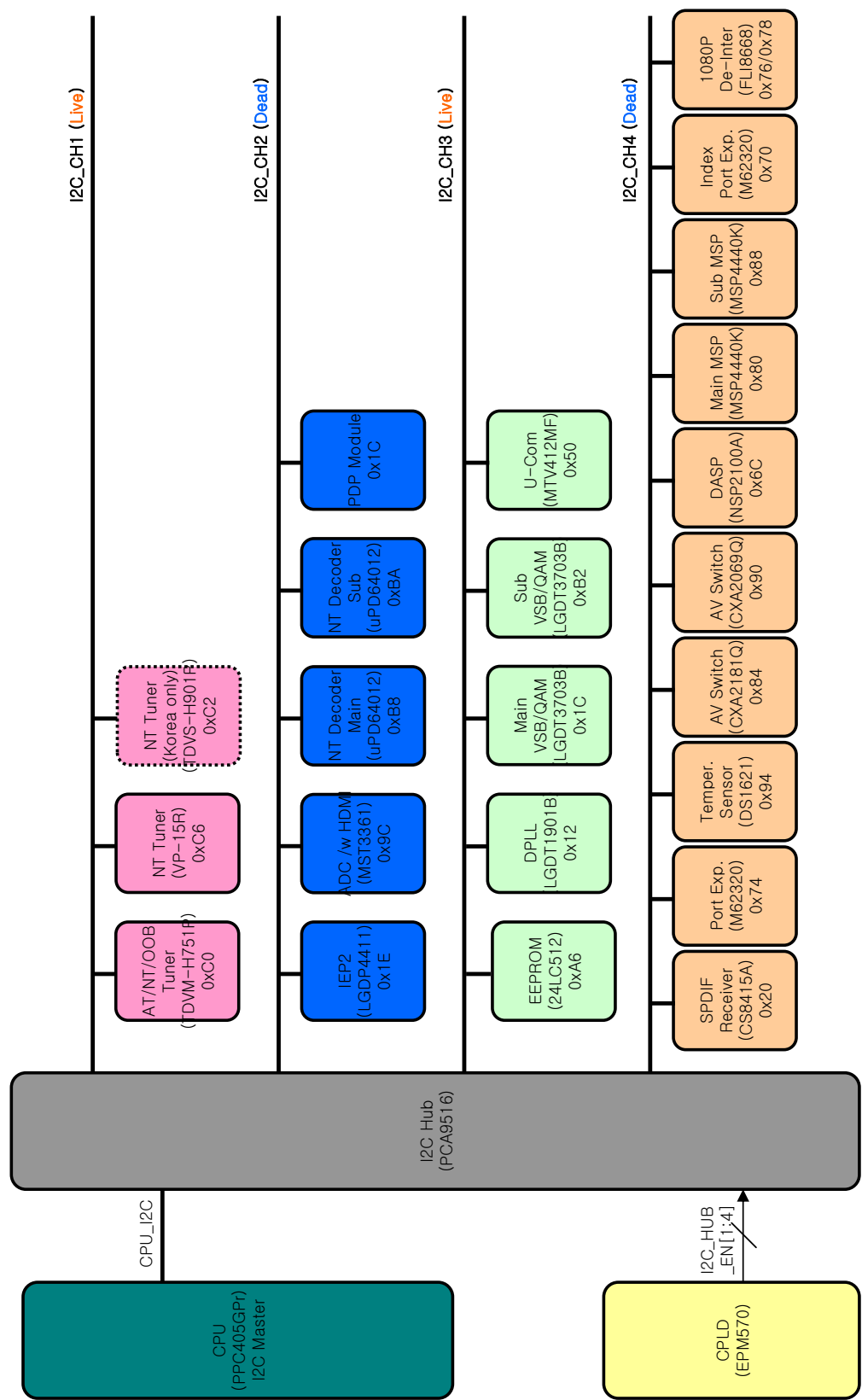
50PC1DR POWER BLOCK DIAGRAM





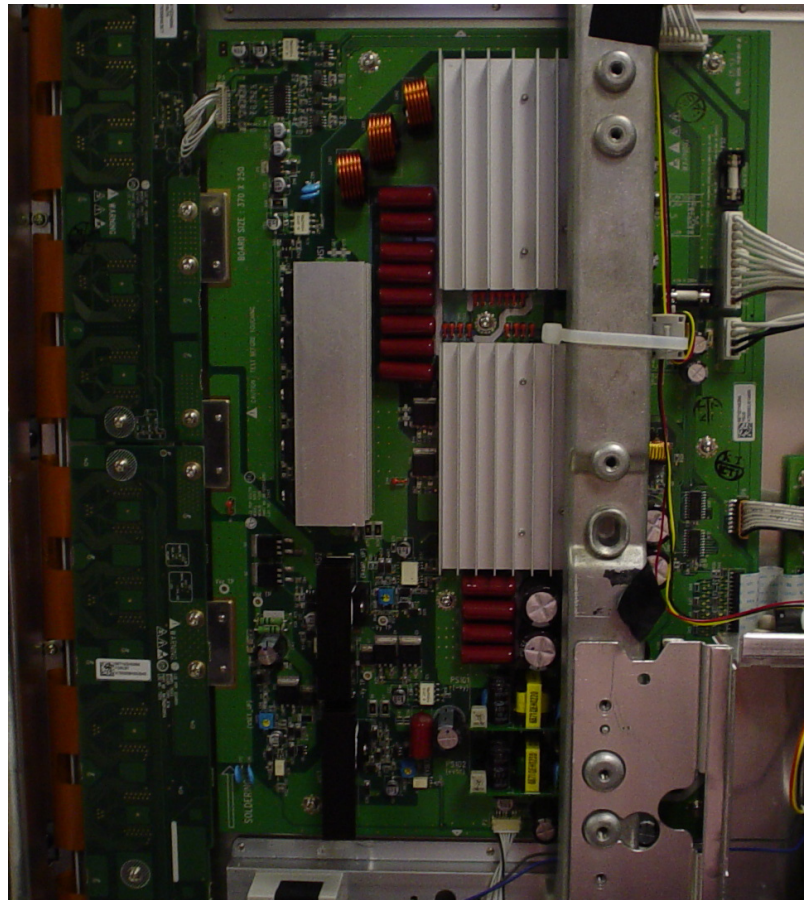
CIRCUIT DESCRIPTIONS

50PC1DR DATA BLOCK DIAGRAM



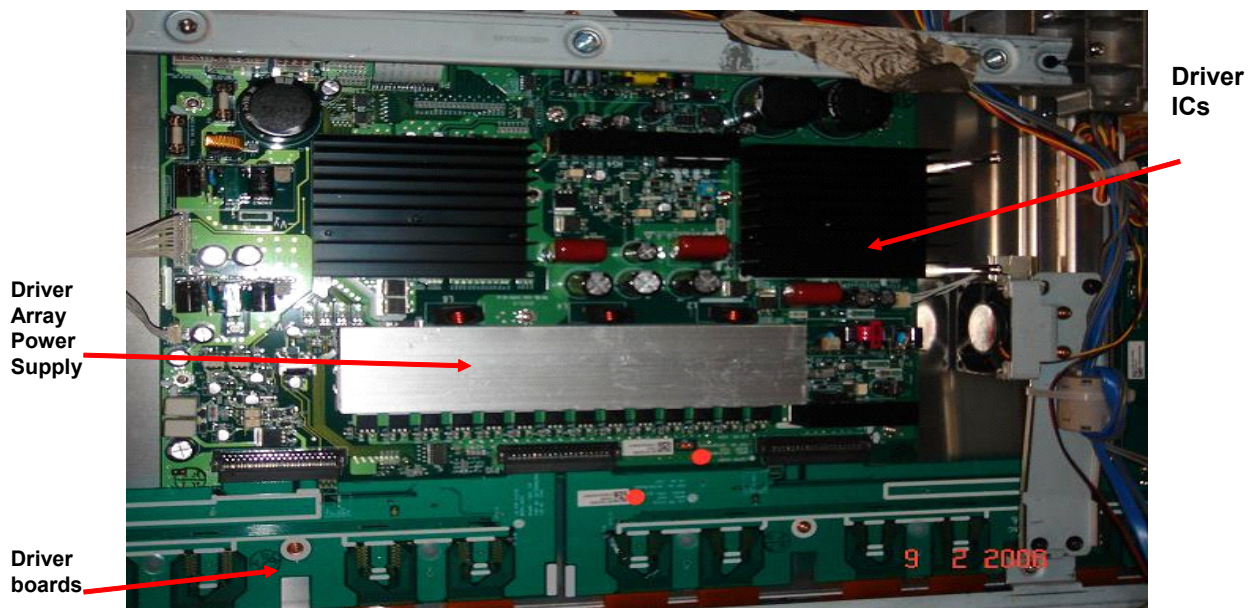
PANEL DRIVE BOARDS

Y-SUSTAIN



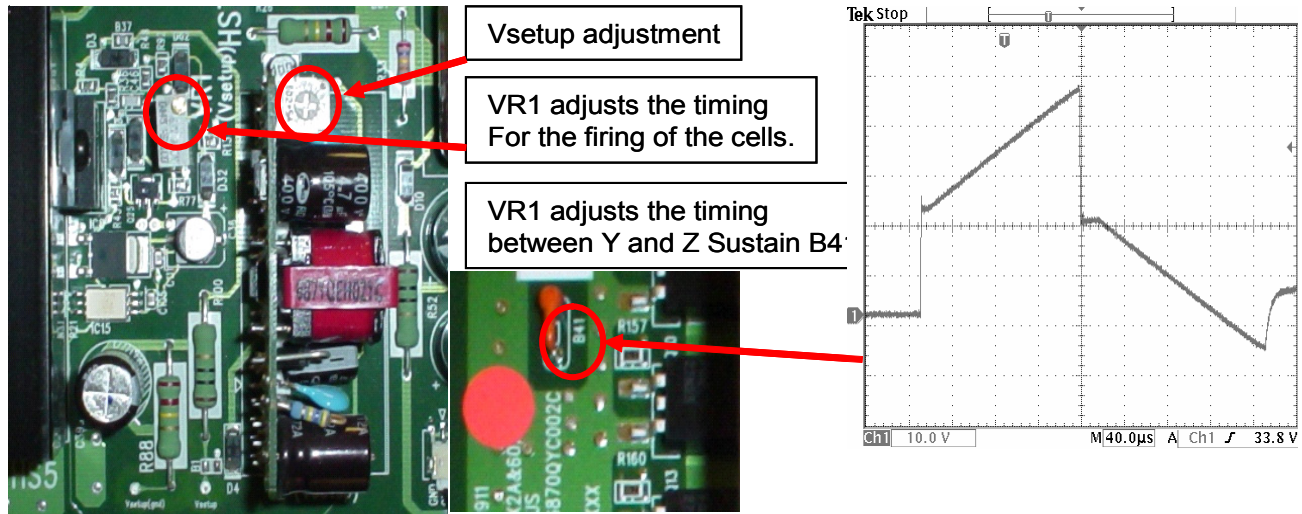
Y-DRIVE

Function: Connected to Scan (Y) electrode and FPC to operate Scan and Sustain. Supply a wave form that energizes the horizontal electrode sequentially. Generates a potential difference between GND and Vpp only in scan period. Brightness and addresses of the pixels comes from this board.



CIRCUIT DESCRIPTIONS

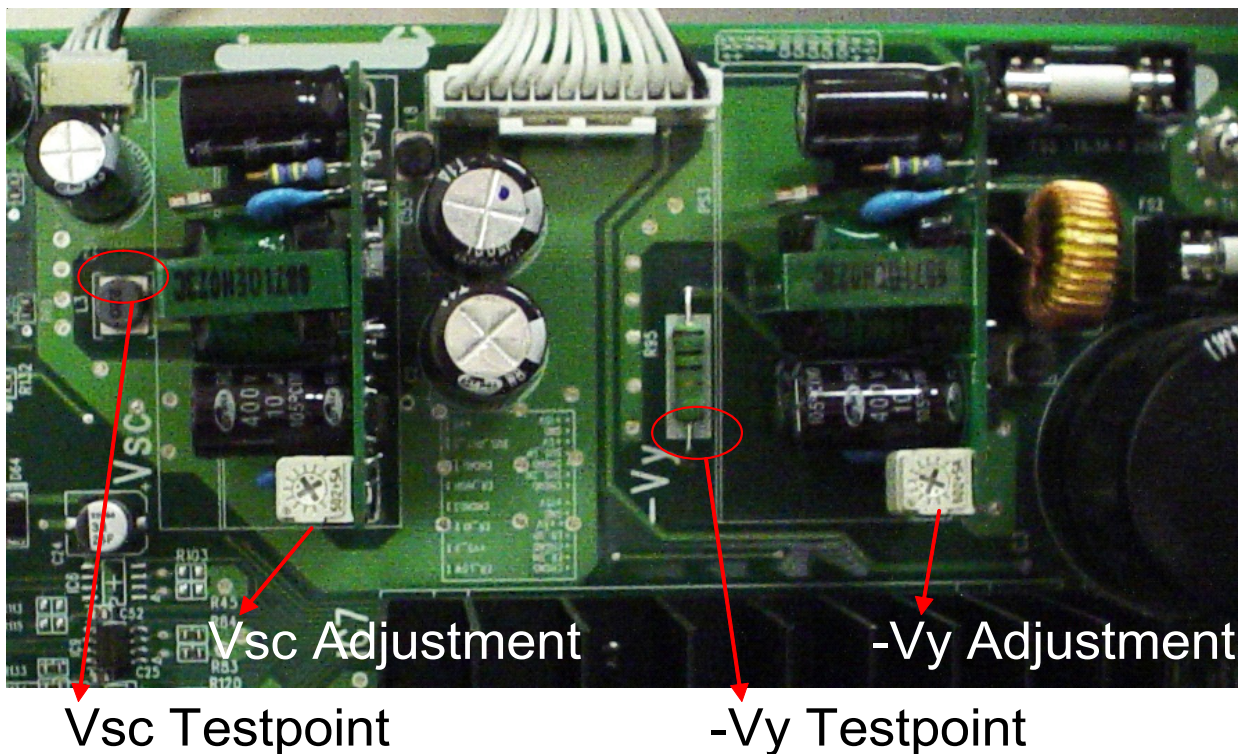
Below are test points for the Y-Drive PCB. It is best to use chassis ground for this scope reading. Use the ground below when measuring DC voltage.



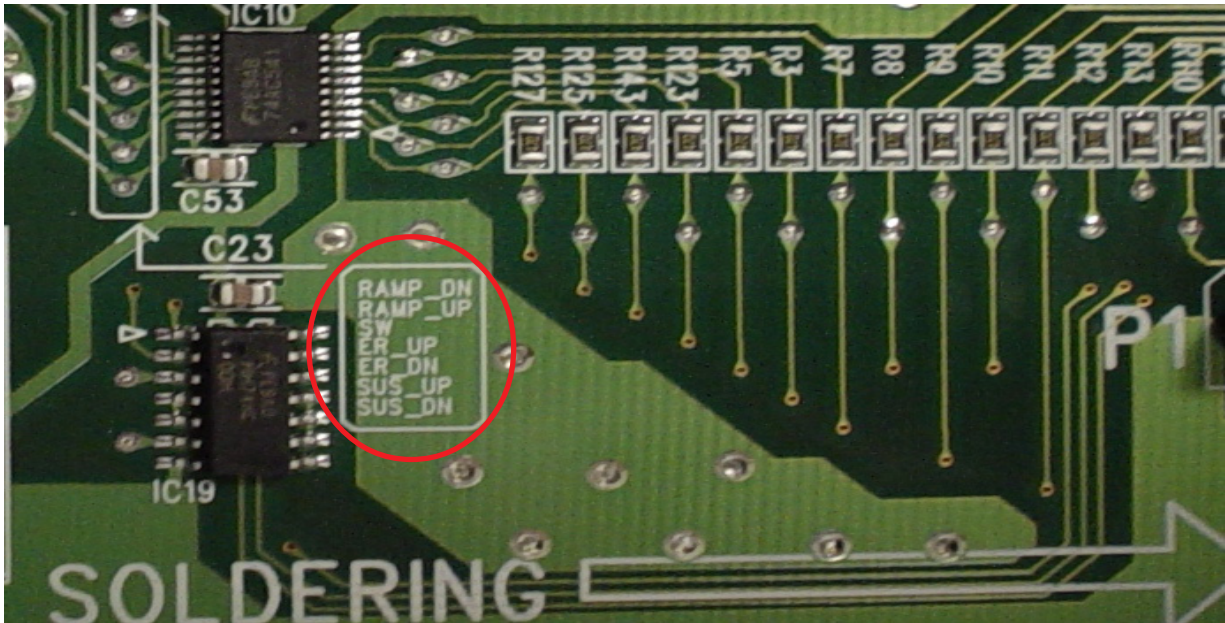
60PY2DR MAIN Y-DRIVE

During normal operation the Vsc at this testpoint is +75Vdc and -Vy is -84Vdc. These adjustments are crucial to the panel performance. The effects you will get when $-V_y$ is too high is minimal on a still image. When this is set too low you will see after image and speckeling in the image due to lack of eliminating the previous displayed image. This occurs at around -125Vdc.

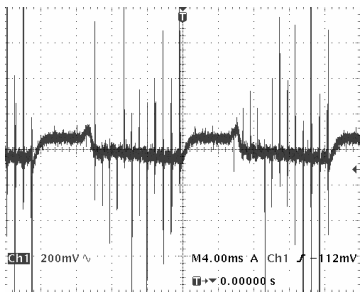
When Vsc is too low the brilliance of the image is not as strong due to lack of drive voltage, this is hard to see with the naked eye. When Vsc is too high the panel begins to over drive and will reduce the life of the panel.



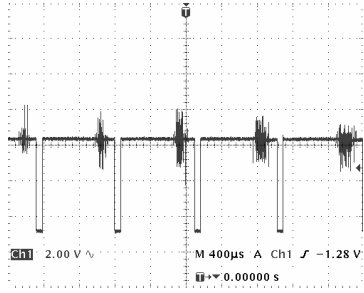
MAIN Y-DRIVE



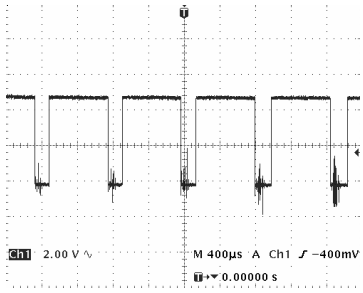
RAMP_DN WAVEFORM



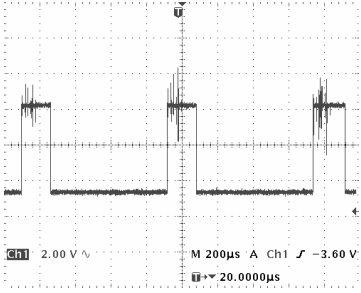
RAMP_UP WAVEFORM



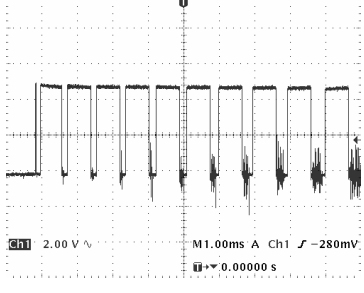
ER_DN WAVEFORM



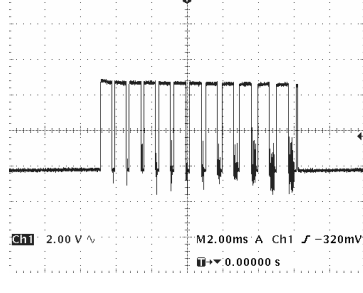
SUS_DN WAVEFORM



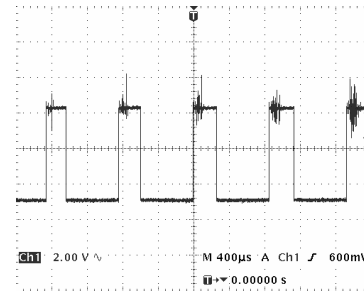
SUS_UP WAVEFORM



ER_UP WAVEFORM



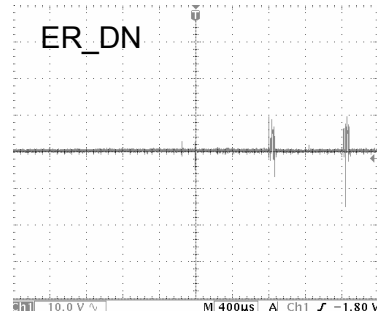
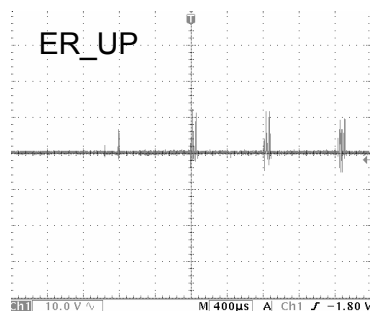
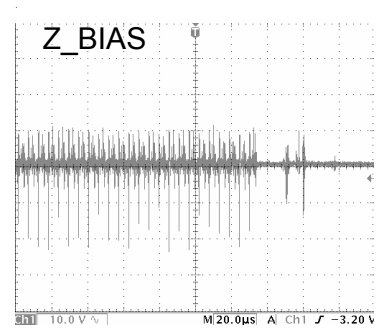
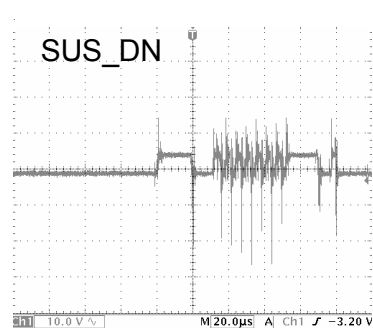
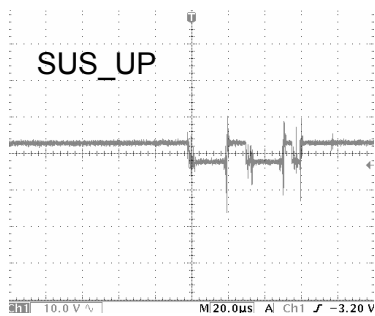
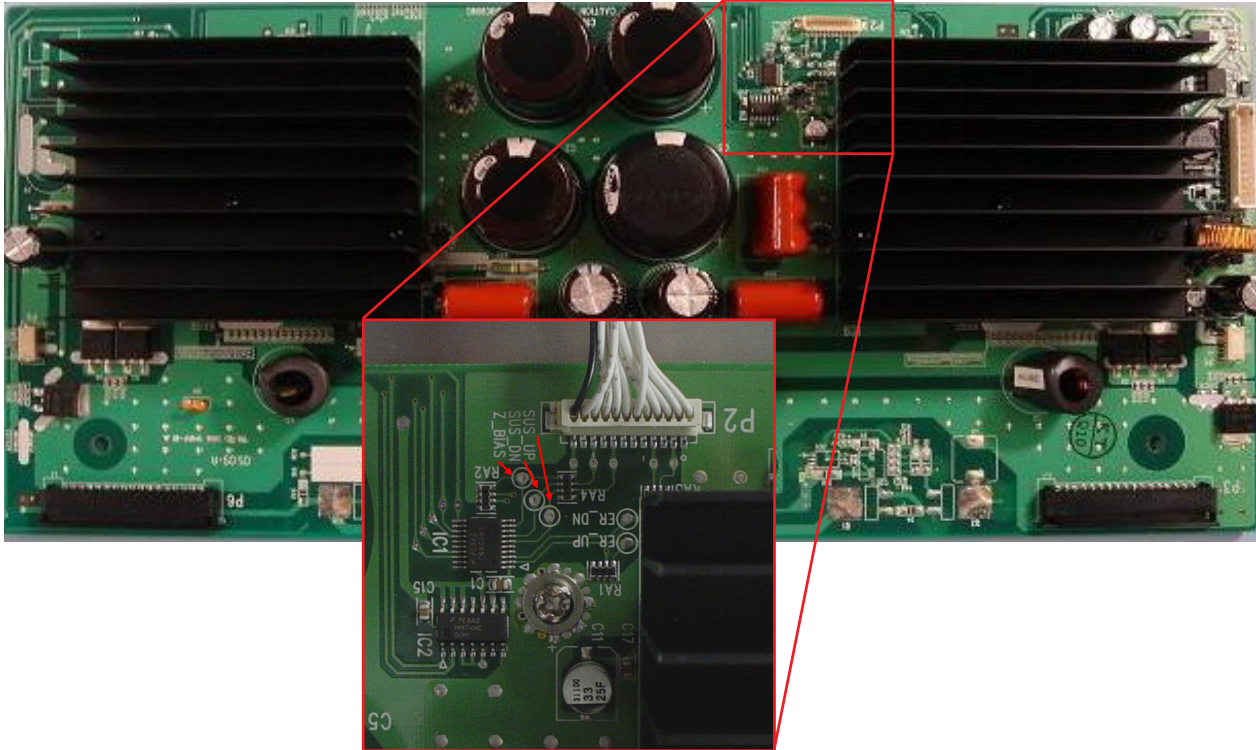
SW



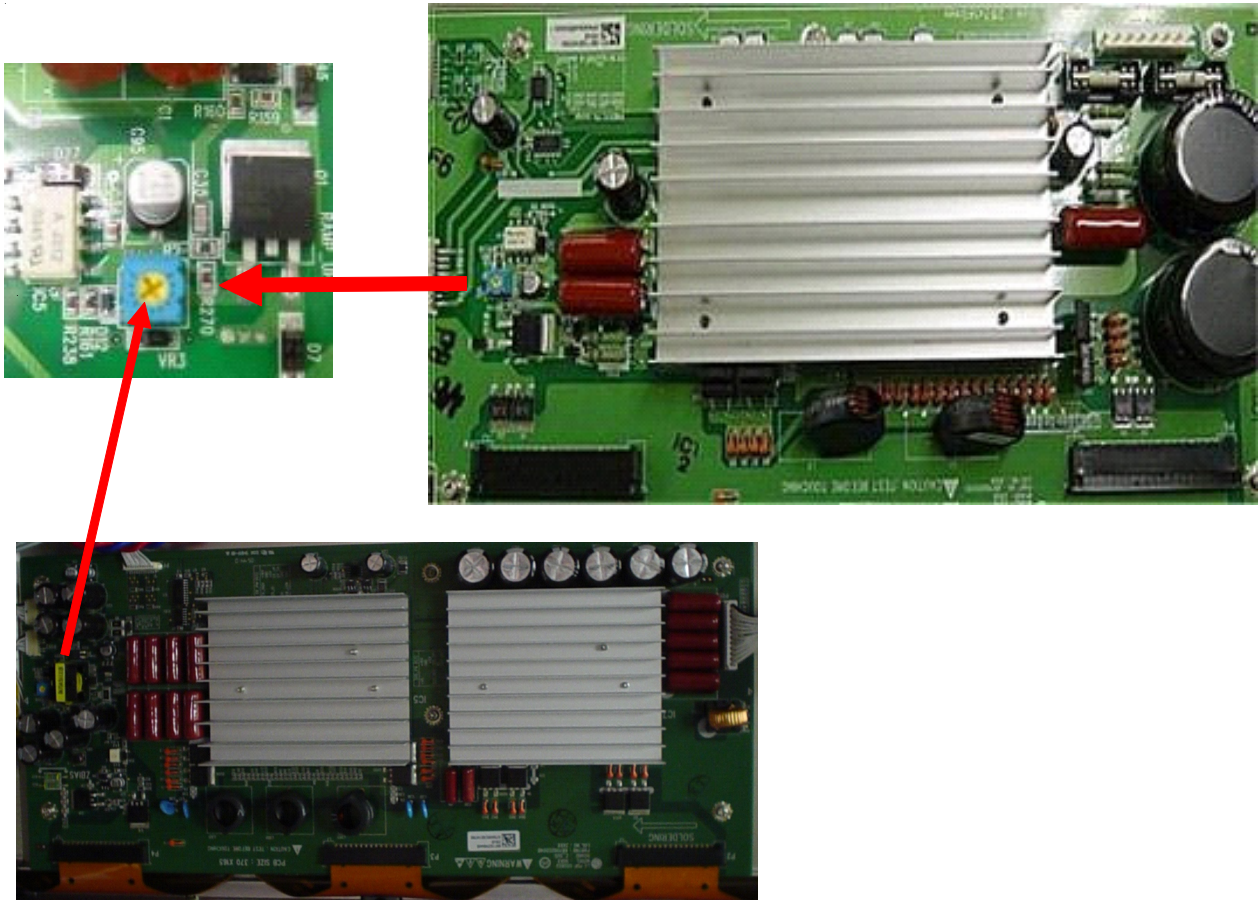
CIRCUIT DESCRIPTIONS

Z-SUSTAIN

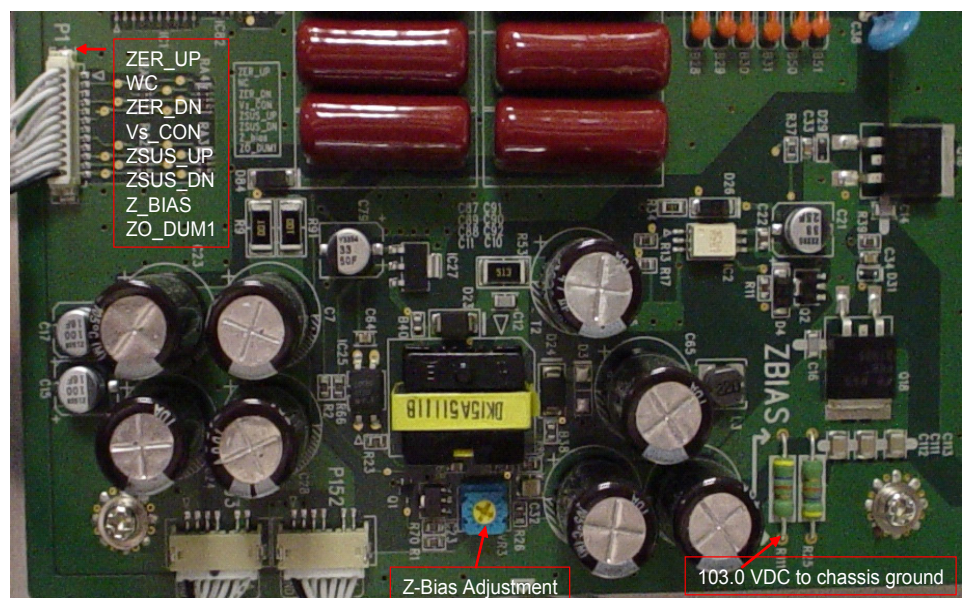
Function: Connected to Sustain (Z) electrode and FPC to operate Sustain. Make the SUSTAIN PULSE and ERASE PULSE that generates SUSTAIN discharge in the panel by receiving the LOGIC signal from the CONTROL B/D. Composed with IPM, FET, DIODE, electrolytic capacitor, E/R coil.



Earlier version of the Z-SUS PCB. Variable resistance of Z RAMP waveform.

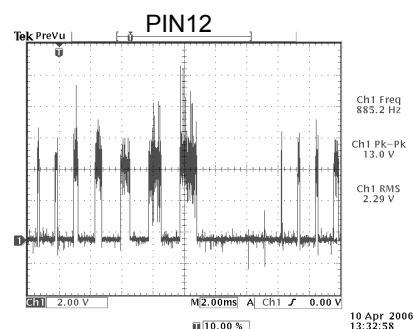
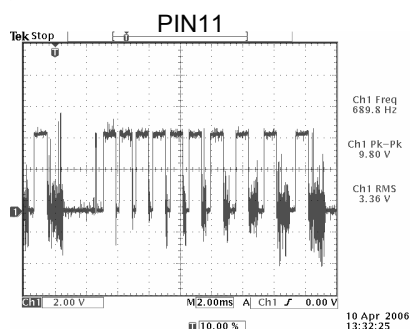
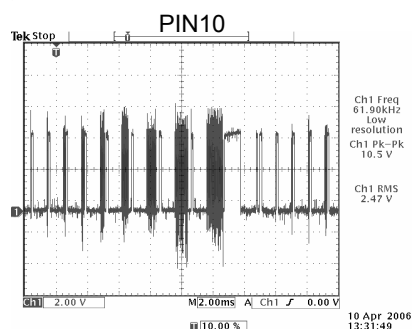
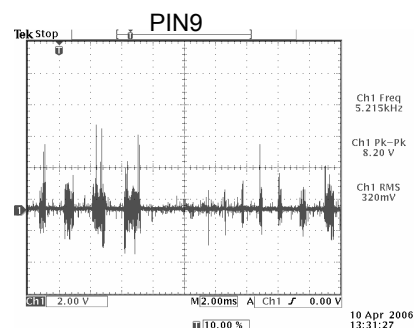
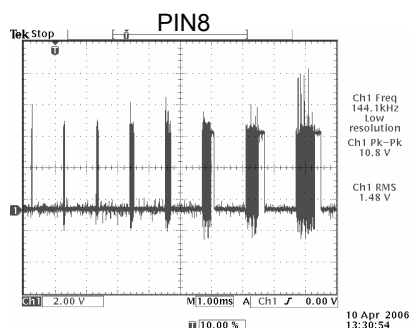
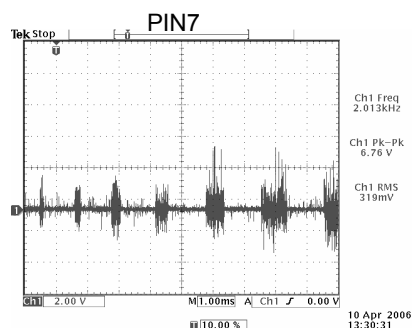
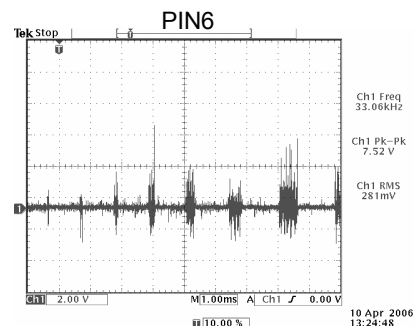
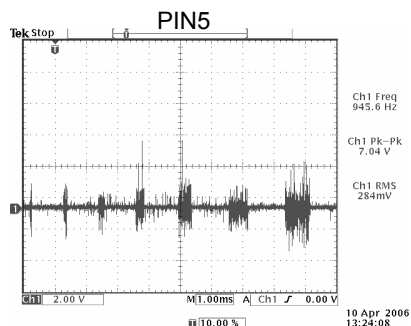
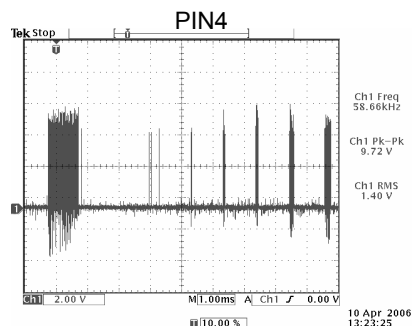
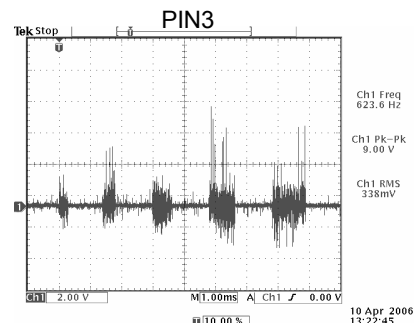
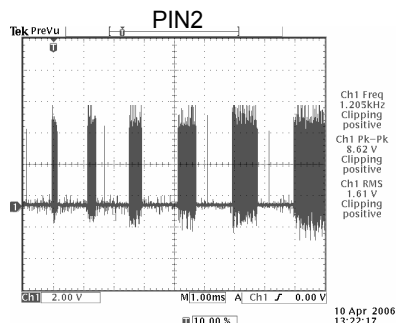
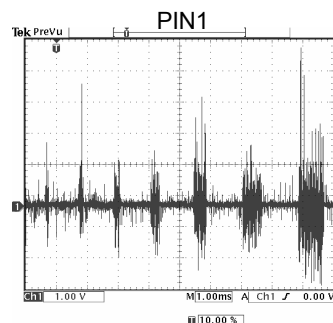
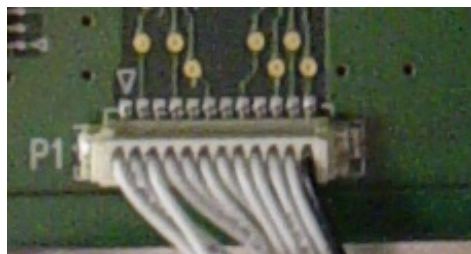


Waveforms for P1 taken from model 50DC1D on the next page.



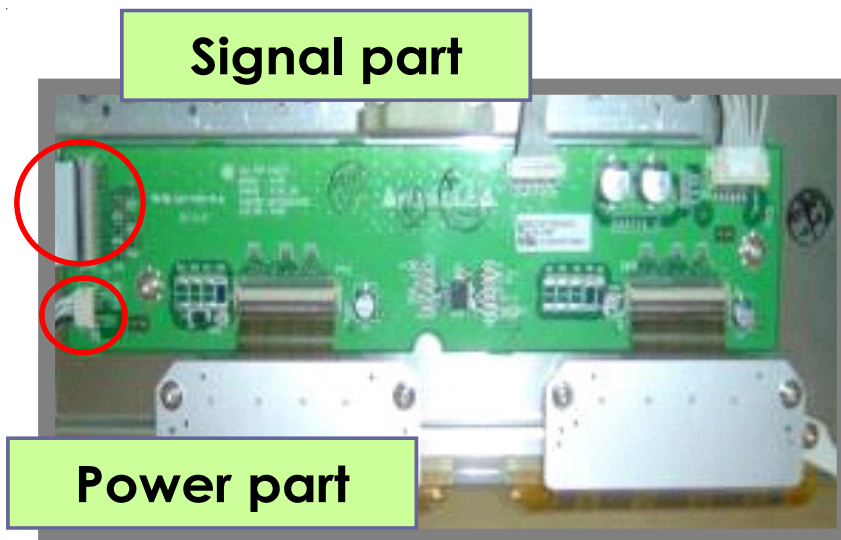
CIRCUIT DESCRIPTIONS

Waveforms for P1 taken from model 50DC1D. From the screen print (P1) as pin one and the black wire as Pin 12.

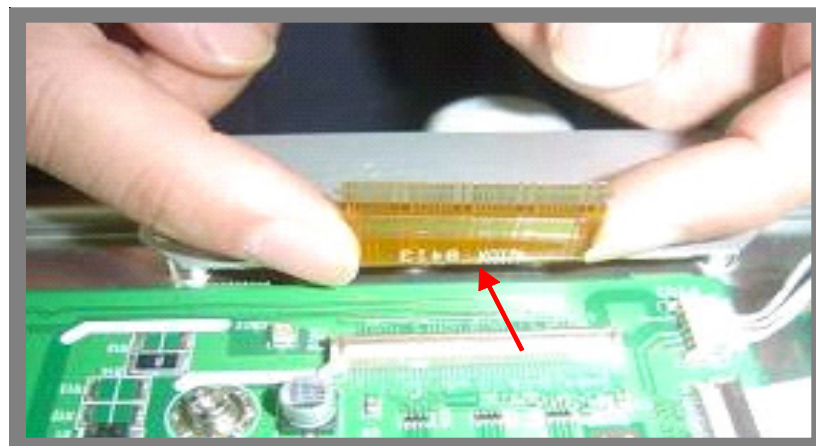


X BOARD

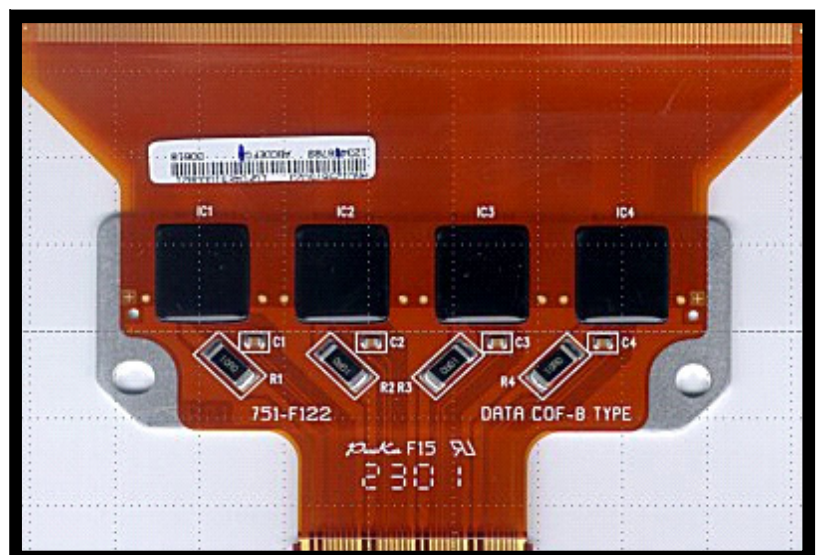
The X board receives a LOGIC signal from the CONTROL B/D and controls the ADDRESS PULSE (generates Address discharge) by an ON/OFF operation, and supplies the waveform to COF(data).



Lift up lock. Pull COF as shown by arrow.

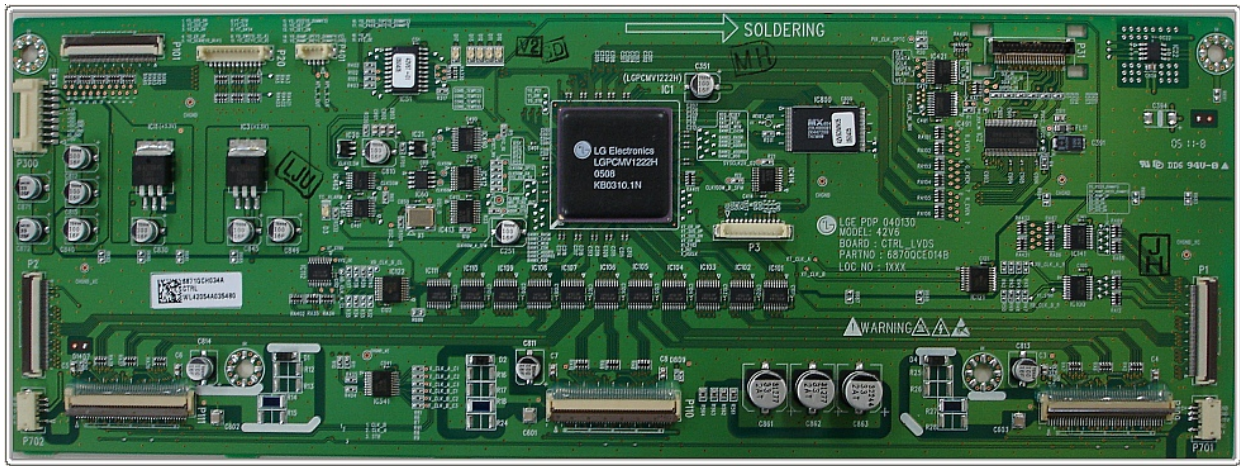


This Ribbon contains the COF IC's.

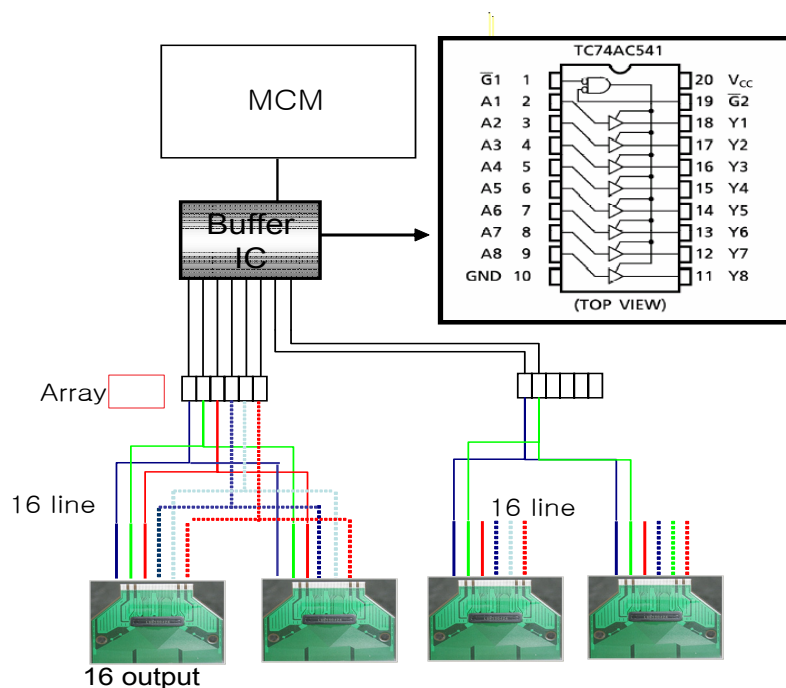


CIRCUIT DESCRIPTIONS

SIGNAL CONTROL

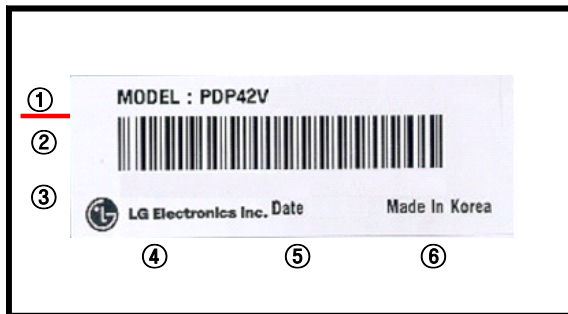


Signal processing (Contour noise, reduction) controls the state of each FET on each DRIVER B/D with R, G, B each with 8bit input (Uses 3.3V/5V 2 kinds of power). This PCB controls all aspects of the PDP panel. This PCB also digitally segments the panel and controls the pixels and cells as if the panel was a large memory IC and changes the data as needed after screen by screen comparison. The data that differs from one frame to another are the addresses that are reset and changed. The software in this PCB differs greatly from the software in the Digital PCB.



PLASMA PANEL

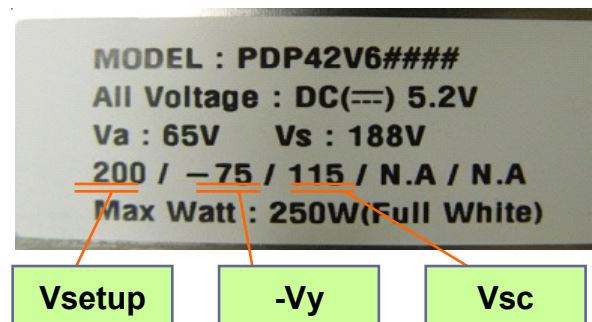
PANEL IDENTIFICATION AND LABELS



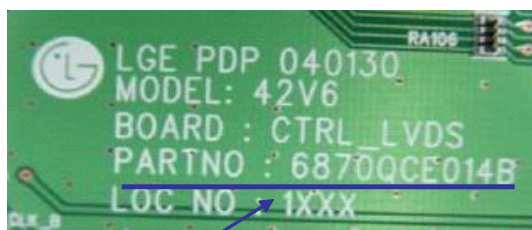
- ① Model Name
- ② Bar Code
(Code 128, Contains the manufacture No.)
- ③ Manufacture No.
- ④ The trade name of LG Electronics
- ⑤ Manufactured date (Year & Month)
- ⑥ The place Origin
- ⑦ Model Suffix

VOLTAGE LABEL

This voltage label is located on the back of the panel, This data is crucial to setting the supplies from the SMPS when a new PCB is installed.



PCB LABELS



PCB Part No



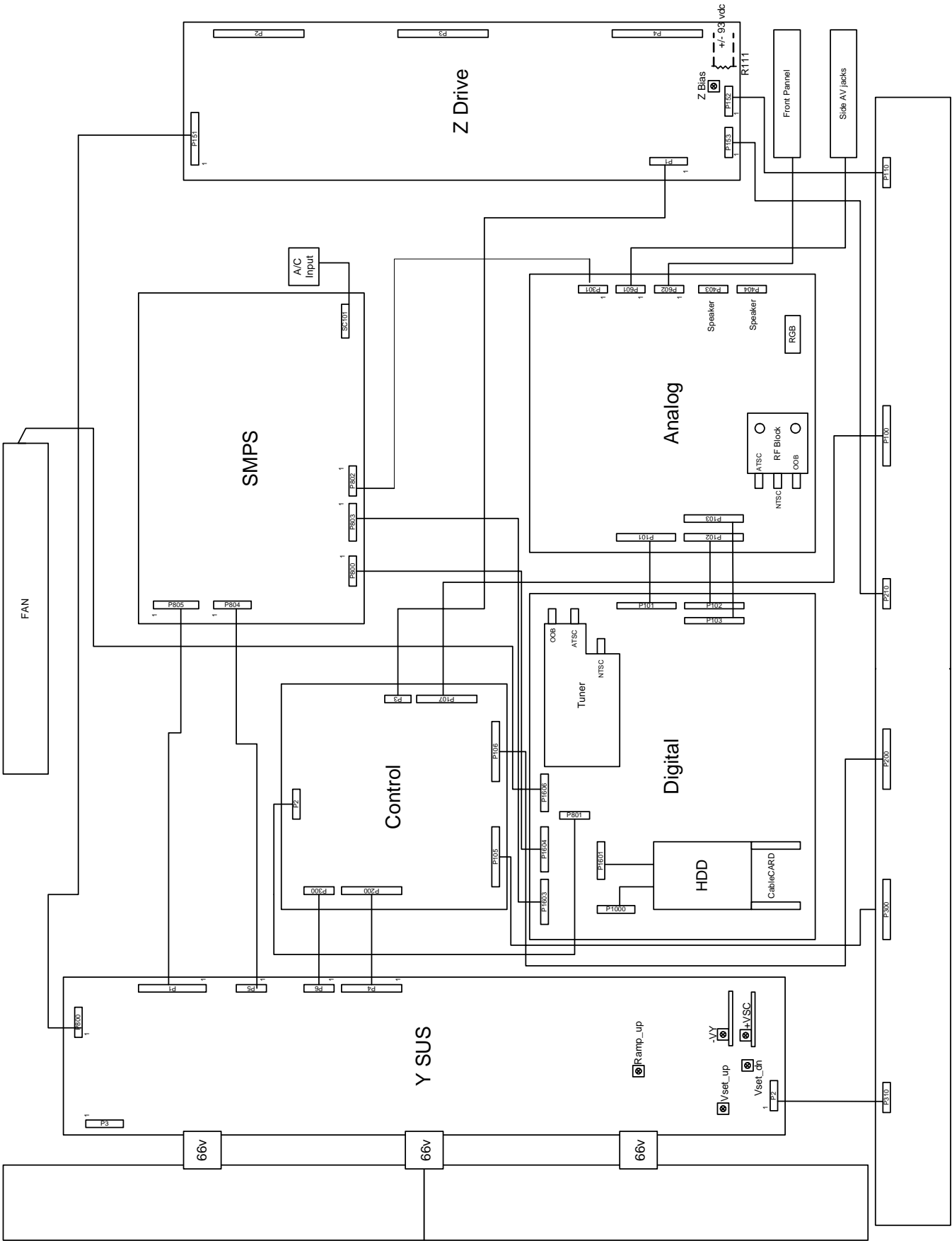
Board Serial No.

CIRCUIT DESCRIPTIONS

CIRCUIT DESCRIPTIONS

50PC1DR

SMPS				Y-Drive						Z Board		
Connector	Pin	Run		Connector	Pin	Run	Connector	Pin	Run	Connector	Pin	Run
P805	1	195.6V		P1	1	195.6VDC	P5	1	5.0VDC	P1	1	1.0VDC
	2	195.6V			2	195.6VDC		2	5.0VDC		2	2.4VDC
	3	195.6V			3	195.6VDC		3	GND		3	1.3VDC
	4	0			4	0		4	GND		4	0
	5	GND			5	GND	P6	1	4.95VDC		5	.7VDC
	6	GND			6	GND		2	4.95VDC		6	0
	7	GND			7	GND		3	4.95VDC		7	0
	8	GND			8	GND		4	4.95VDC		8	0
	9	59.6V			9	59.6VDC		5	GND		9	.5VDC
	10	59.6V			10	59.6VDC		6	GND		10	0
Connector	Pin	Run		P2	1	0		7	GND		11	2.5VDC
P804	1	GND			2	0		8	GND		12	0
	2	GND			3	4.9VDC				1	4.9VDC	
	3	5.00VDC			4	4.9VDC				2	4.9VDC	
	4	5.00VDC			5	0				3	GND	
Connector	Pin	Stby	Run		6	59.6VDC				4	GND	
P800	1	4.78VDC	4.8VDC		7	59.6VDC				5	GND	
	2	4.42VDC	4.42VDC		1	0				6	GND	
	3	4.97VDC	4.9VDC	2	5.17VDC	P151				7	1.9VDC	
	4	0	0	3	5.0VDC					8	60.3VDC	
	5	0	4.6VDC	4	0					9	60.3VDC	
	6	0	4.9VDC	5	6.0VDC					10	1.4VDC	
	7	0	4.9VDC	6	1.5VDC					11	196.5VDC	
	8	4.98VDC	4.9VDC	7	3.9VDC					12	196.5VDC	
	9	0	0	8	0					P152	1	0
	10	0	0	9	4.7VDC						2	0
	11	5.98VDC	5.9VDC	10	0		3				4.9VDC	
	12	0	0	11	.1VDC		4				4.9VDC	
	13	3.2VDC	3.2VDC	12	0		5				0	
	P802	1	19.3VDC	19.3VDC	1		0				P153	6
2		19.3VDC	19.3VDC	2	4.42VDC	7	60.3VDC					
3		0	0	3	0	1	0					
4		0	0	4	0	2	0					
5		5.9VDC	5.9VDC	5	2.6VDC	3	4.9VDC					
6		0	1	6	0	4	4.9VDC					
7		3.3VDC	3.3VDC	7	0	5	0					
8		0	1	8	1.9VDC	6	60.3VDC					
9		12.1VDC	12.1VDC	9	0	7	60.3VDC					
10		0	1	10	.3VDC	Analog PCB						
P803	1	3.3VDC	3.3VDC	11	.14VDC	Connector	Pin	Run	Connector	Pin	Run	
	2	3.3VDC	3.3VDC	12	0	P101	1	GND	P301	1	19.3VDC	
	3	0	0	13	2.6VDC		2	2.69VDC		2	19.3VDC	
	4	0	0	14	2.8VDC		3	GND		3	0	
	5	5.9VDC	5.9VDC	15	0		4	1.4VDC		4	0	
	6	5.9VDC	5.9VDC	16	0		5	GND		5	5.9VDC	
	7	0	0	17	0		6	2.0VDC		6	0	
	8	0	0	18	1.0VDC		7	GND		7	3.3VDC	
	9	12.1VDC	12.1VDC	19	0		8	2.16VDC		8	0	
	10	12.1VDC	12.1VDC	20	.3VDC		9	GND		9	12.1VDC	
	11	0	0	21	1.3VDC		10	1.9VDC		10	0	
	12	0	0	22	3.7VDC		11	GND	P602	1	GND	
P4	23	0		12	2.1VDC		2	3.3VDC				
	24	2.9VDC		13	GND		3	GND				
	25	.33VDC		14	2.2VDC		4	4.9VDC				
	26	.2VDC		15	GND		5	0				
	27	.28VDC		16	2.2VDC		6	4.0VDC				
	28	0		17	GND		7	0				
	29	3.9VDC		18	2.2VDC		8	3.3VDC				
	30	0		19	GND		9	GND				
						10	3.3VDC					



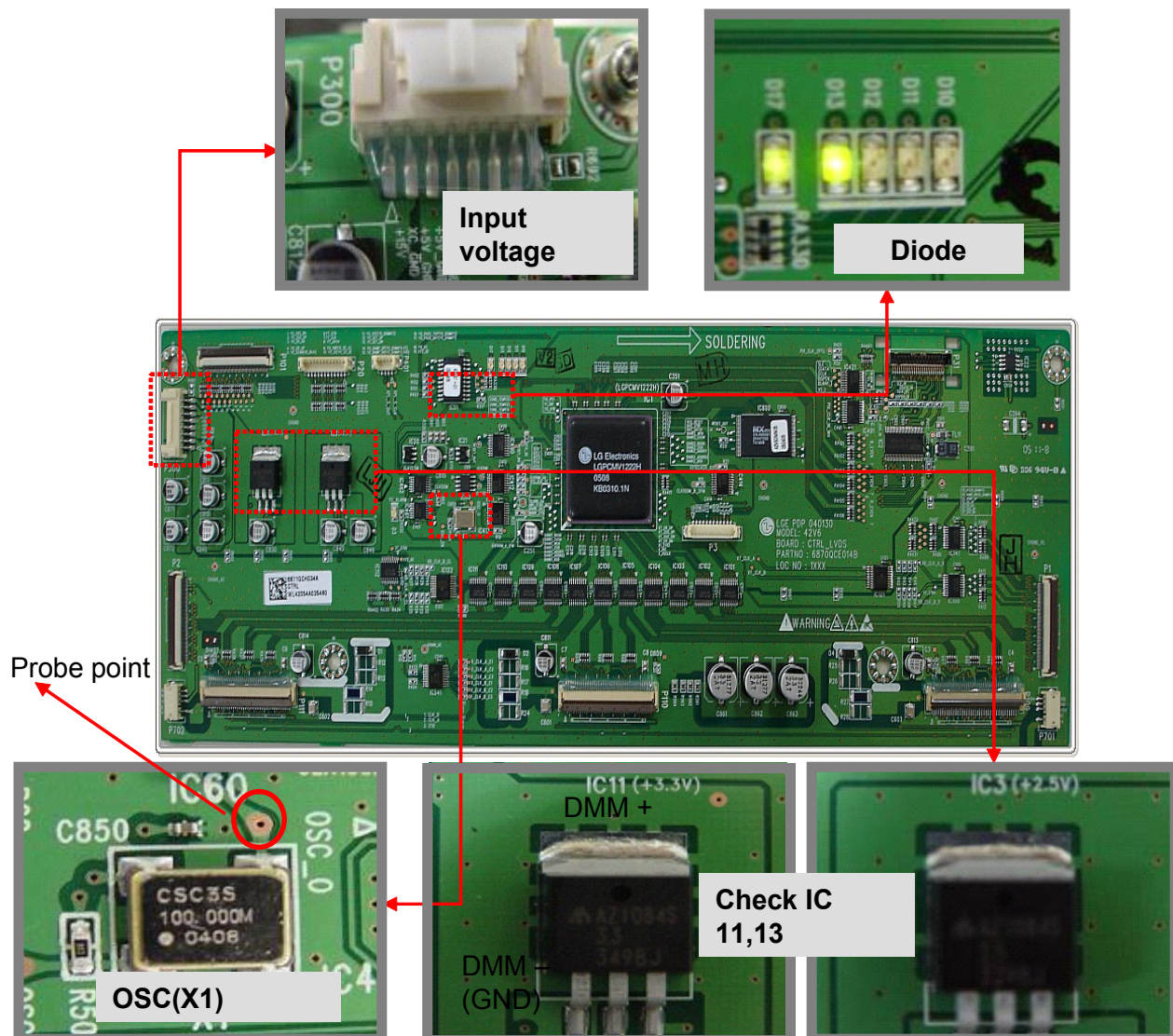
TROUBLESHOOTING

This section addresses problems you may encounter. This section should be used in conjunction with the Circuit Descriptions. There may be adjustments required after changing a board or component, Refer to the Circuit Descriptions section.

Again, the DVR (Digital Video Recorder), DCR (Digital Cable Ready) and TV Guide features are not discussed in this section, they each have their own section near the end of this manual.

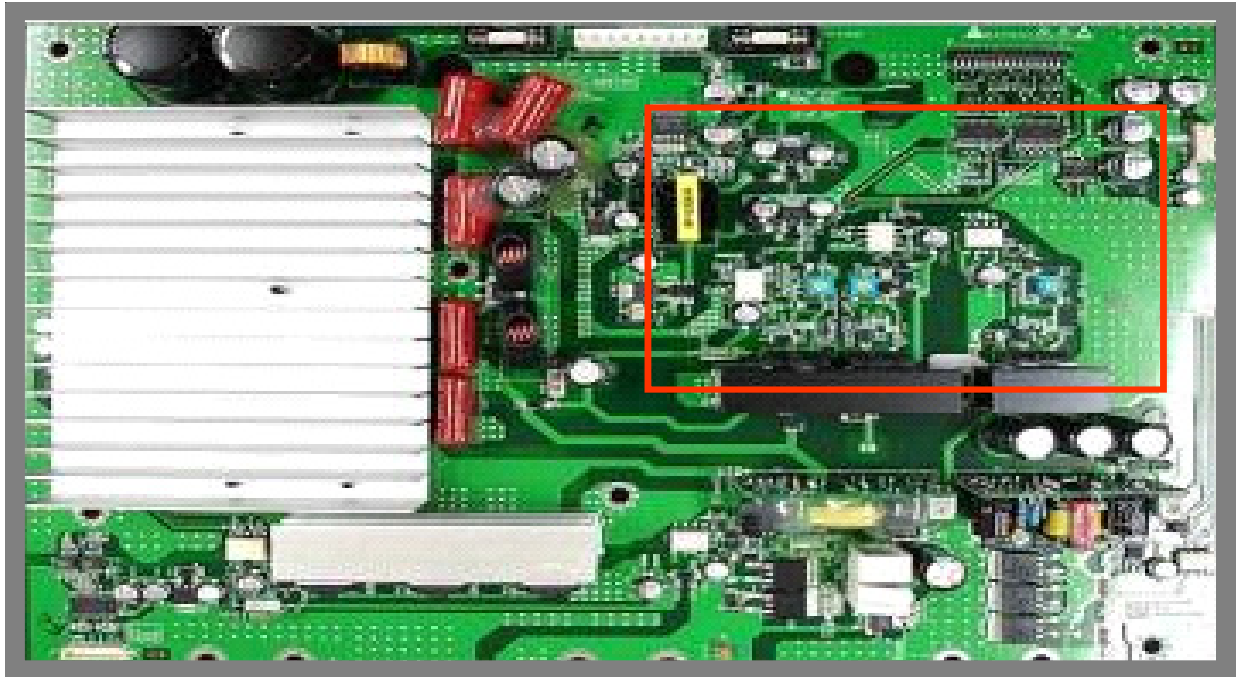
SIGNAL CONTROL TROUBLESHOOTING

1. Confirm LED D17 is flashing, D13 is lit.
2. If not, CHECK OSC X1 output.
3. Check CTRL input voltage at P300
4. CHECK for 3.3V, 5V, 15V.
5. Check IC 11 for 3.3V, IC 3 for 2.5V



Z-SUSTAIN TROUBLESHOOTING

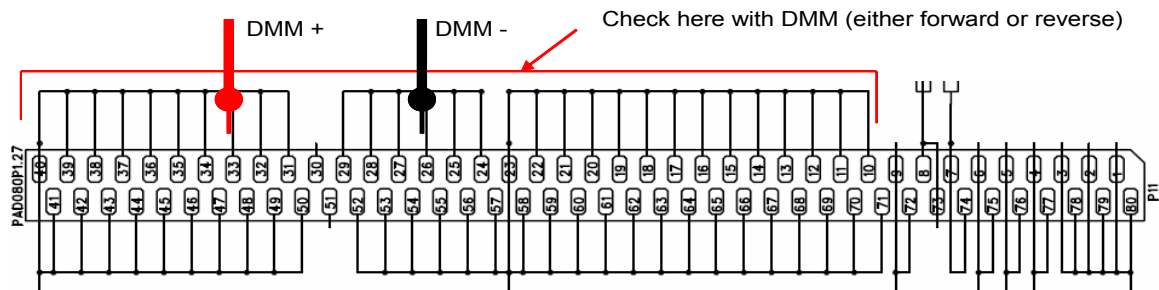
Check the output of X1 (normal is 100 MHz). The DC/DC converter makes 5V, V_a, V_s, V_{set_up}, V_{sc} which is essential for each B/D. There is no separated DC/DC B/D in model our later plasma models. They are embedded DC/DC circuits as part of another PCB as seen below.



Y_DRIVE PCB

NOTE:

Use a DVM as shown below set to diode check either forward or reverse bias to check the drive IC.



TROUBLESHOOTING THE COF ICS

COF is Chip On Film. If any of the tests indicate the junction is shorted or leaking, the adjacent COF IC is defective. As a result the PDP panel will have to be replaced. Each resistor is a 10.2 - 10.8 ohm resistor.

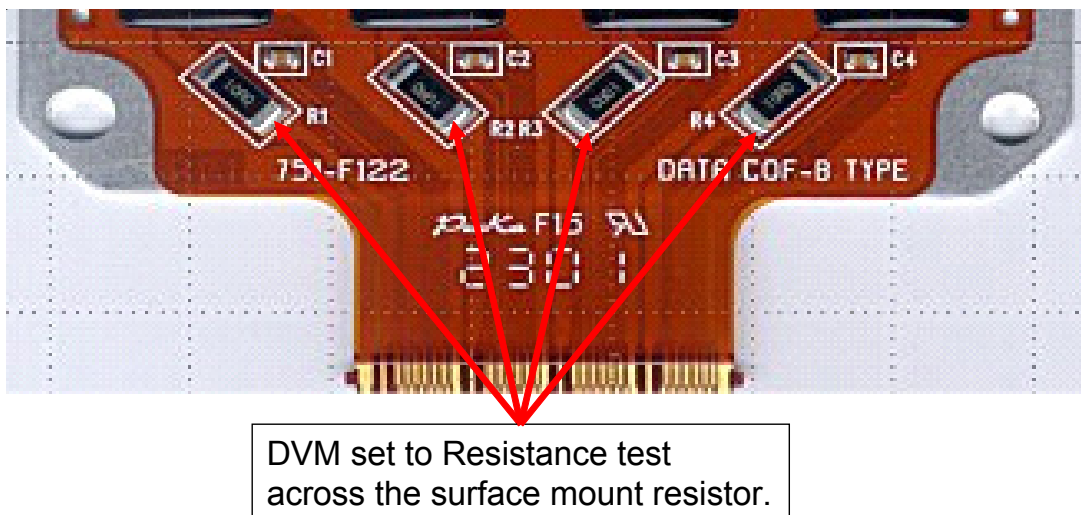
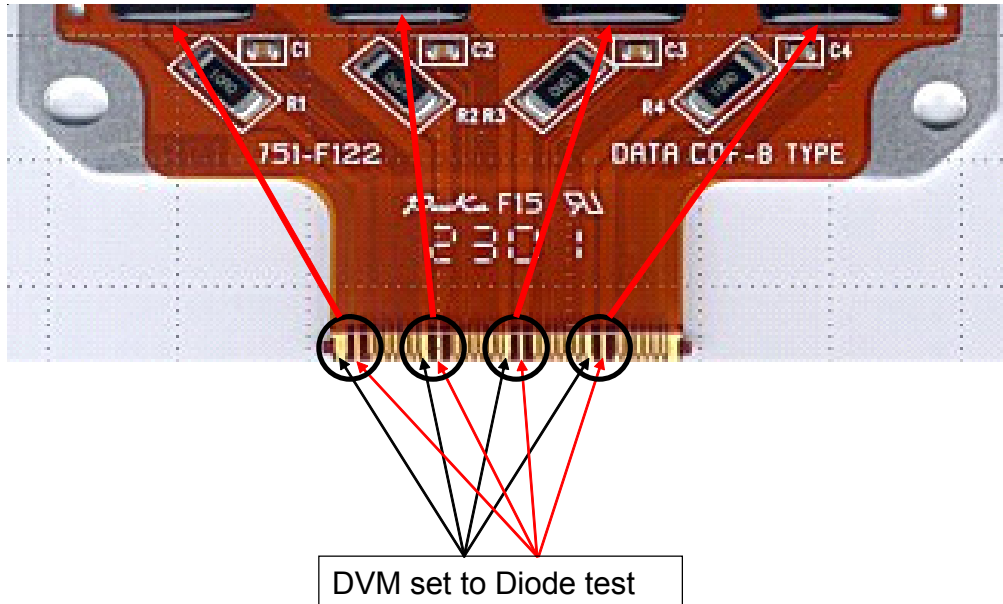
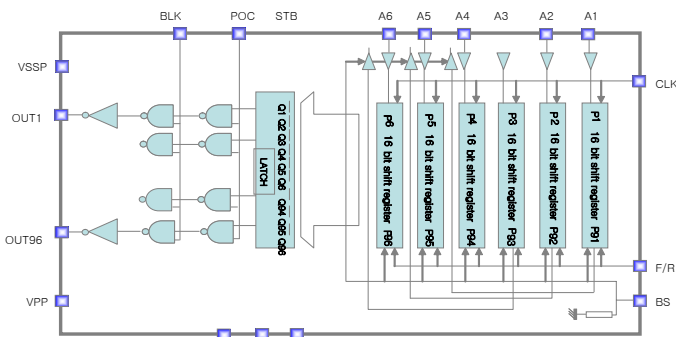
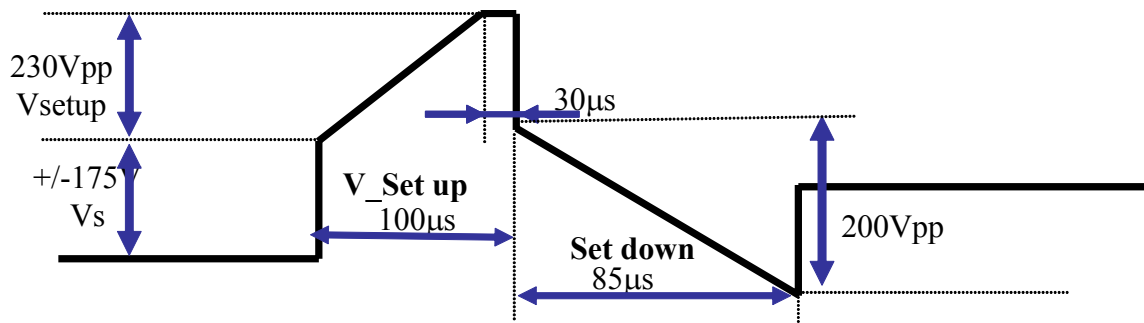


DIAGRAM OF THE COF IC



50PC1D

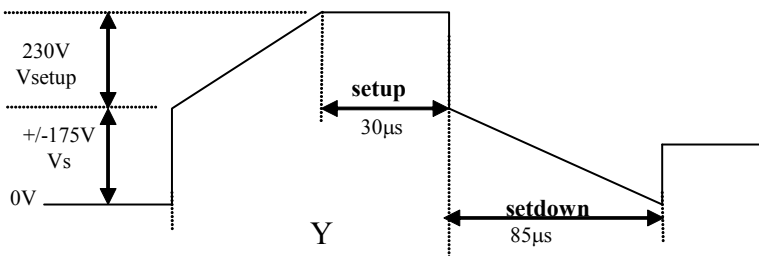
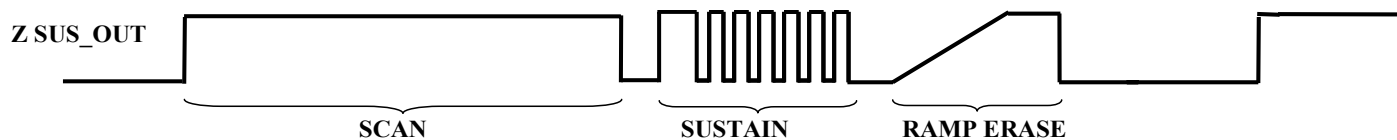


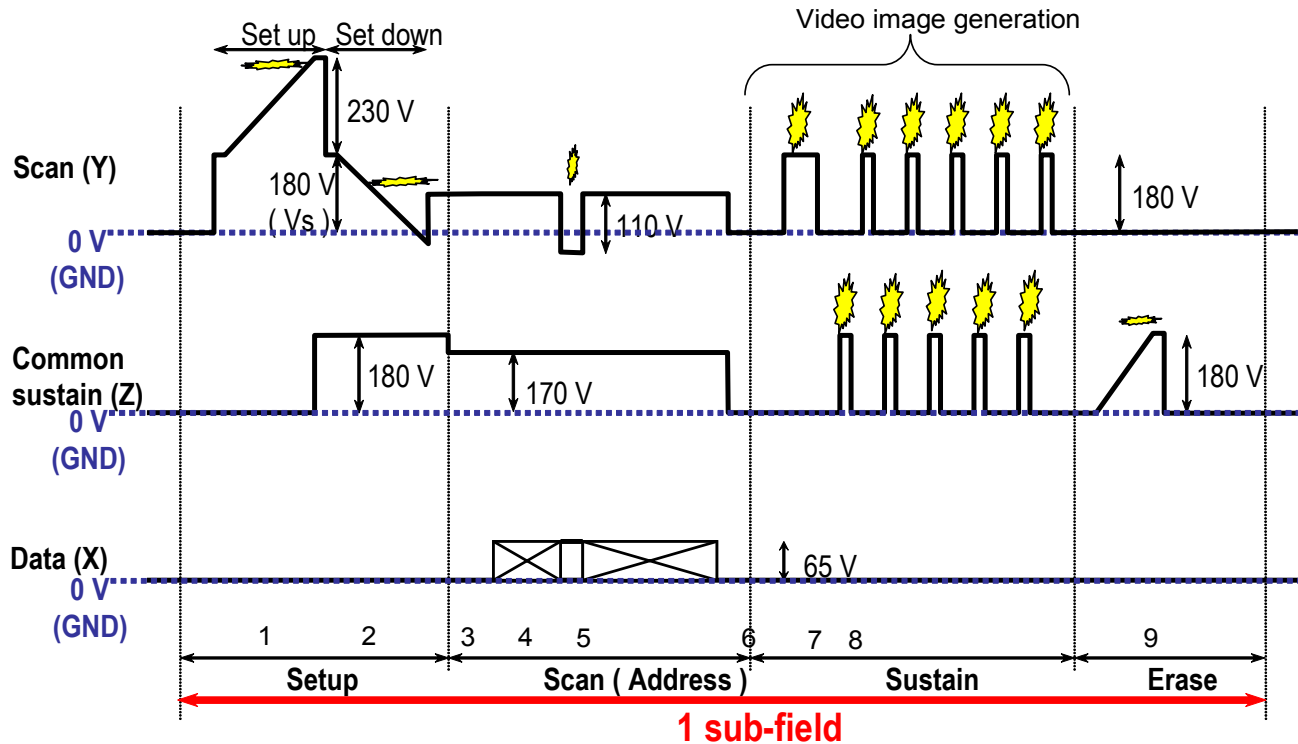
Why the electric discharge happens when it is not supposed to.

Wavelength above shows **V_setup / V_set down** that created wall charges inside panel. The wall charges that are created by “setup/down” wavelength, has an important role for address electric discharge.

- If **V_s** is less than the value on the panel label.
- The slope of “set down” period descends
- The amount of wall charge decreases.
- The picture gets darker and set turns off eventually
- If **V_s** is greater than the value of panel label.
- The slope of set down will shorten.
- Amount of wall charge increases
- Picture gets brighter because it can't display gray scale.

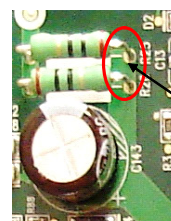
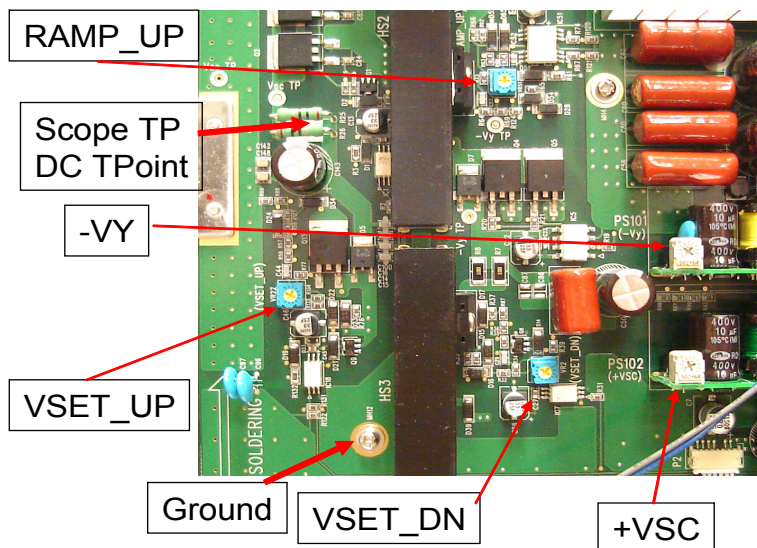
Therefore, incorrect electric discharge occurs.





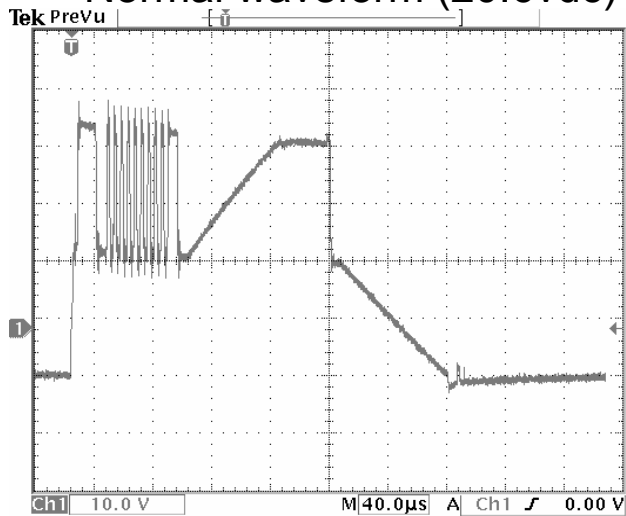
1. Increase the amount of wall charge by gradually increasing voltage.
2. Decrease created wall charge to certain amount by gradually decreasing voltage.
3. Prepare for scan to keep certain amount of wall charges.
4. Another line is scanning nothing happens.
5. Current line is scanning voltage obtained is X electrode and wall charge on Y electrode conflicts and discharge occurs.
6. Wall charge increased by scan step.
7. Voltage obtained on Y electrode and wall charge in Z electrode conflicts and discharge occurs.
8. Voltage obtained on Y electrode and wall charge in Z electrode conflicts and discharge occurs.
9. Remove all wall charges by gradually increasing voltage.

Y-Sustain PCB testpoints:

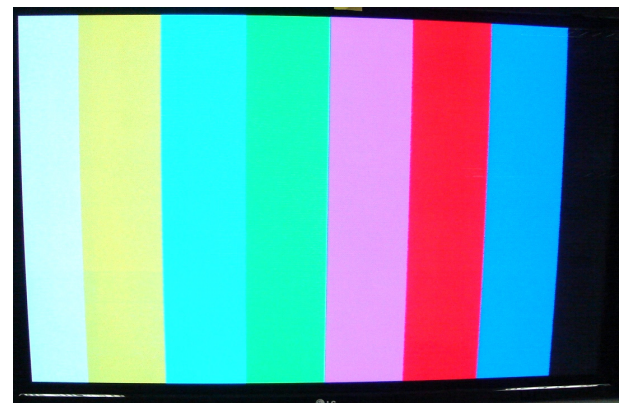
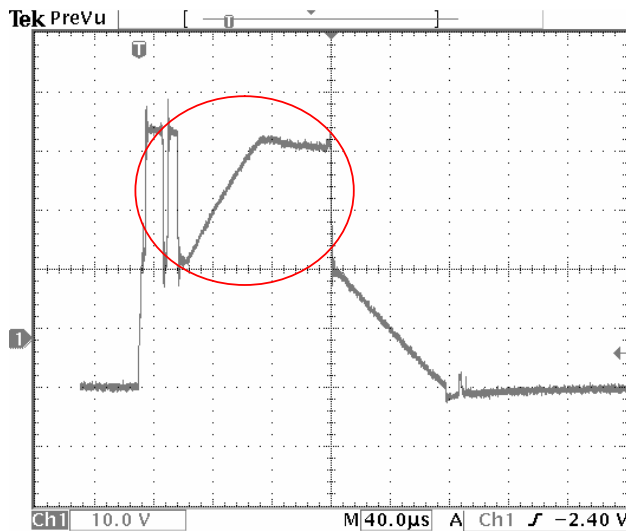


This test point is the reference for all the following signals referred to here. Readings are taken with the probe set to 10x1.

Normal waveform (20.6vdc)

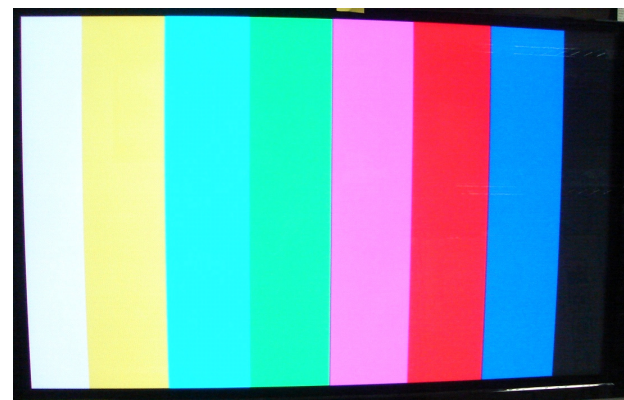
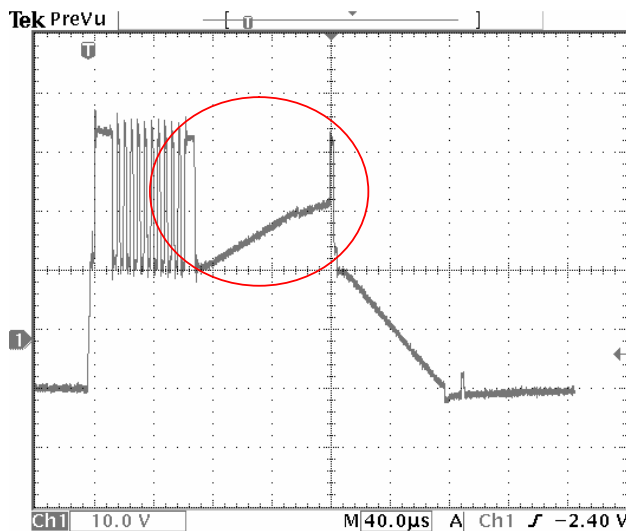


Ramp_up too high (22vdc)



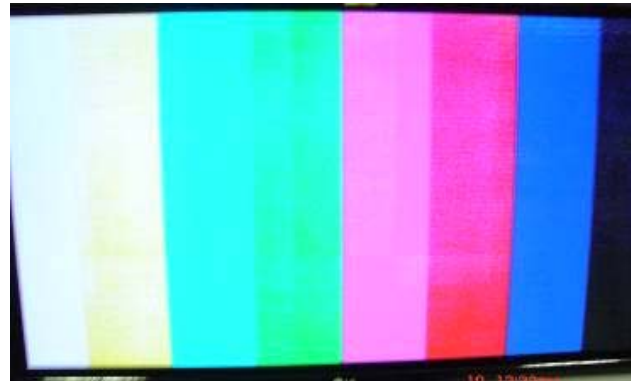
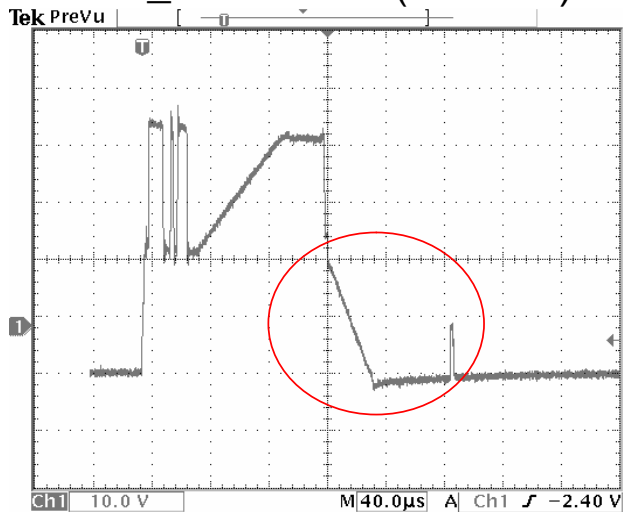
Noticeable low level color distortion with the Ramp_up too low.

Ramp_up too low (15.2vdc)



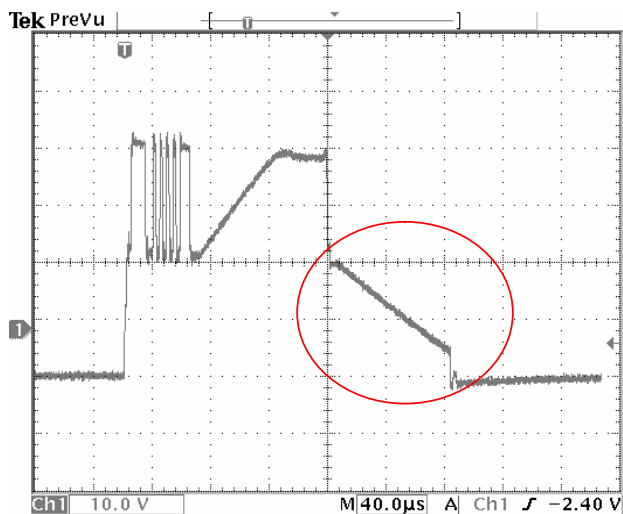
Noticeable low level color distortion with the Ramp_up too high.

Vset_DN too low (16.8vdc)



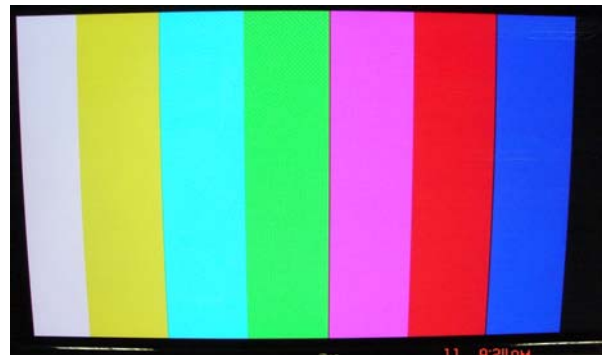
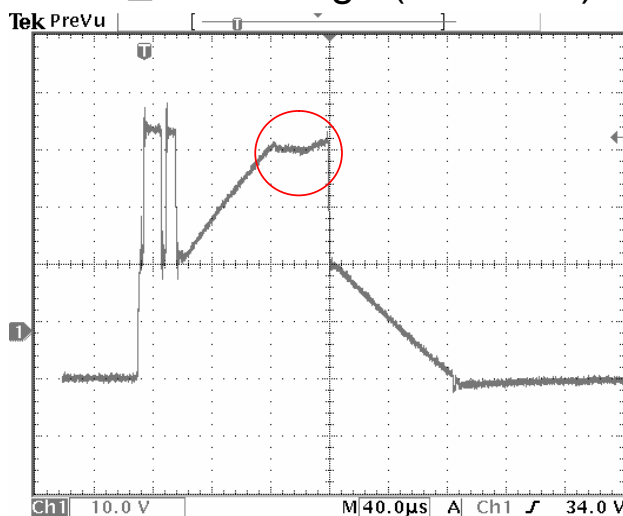
All of the center washes out due to decreased **Vset_DN** time.

Vset_DN too high (19.7vdc)



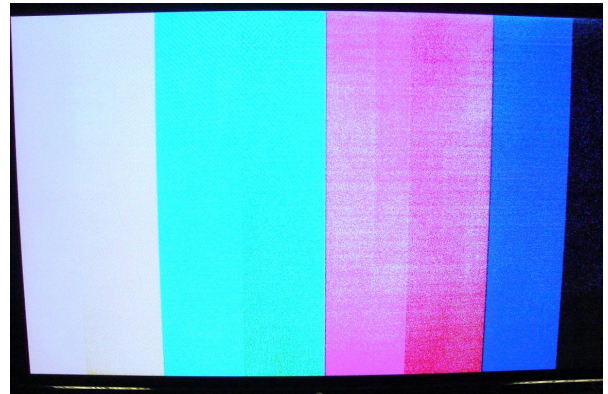
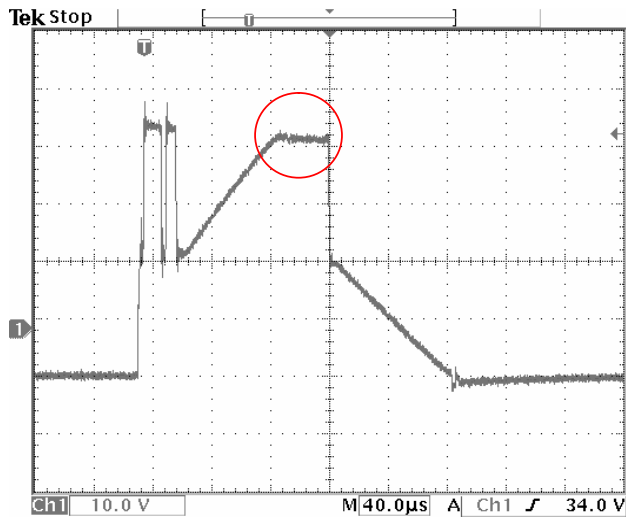
The center begins to wash out and arc due to decreased **Vset_DN** time.

Vset_UP too high (28.33vdc)



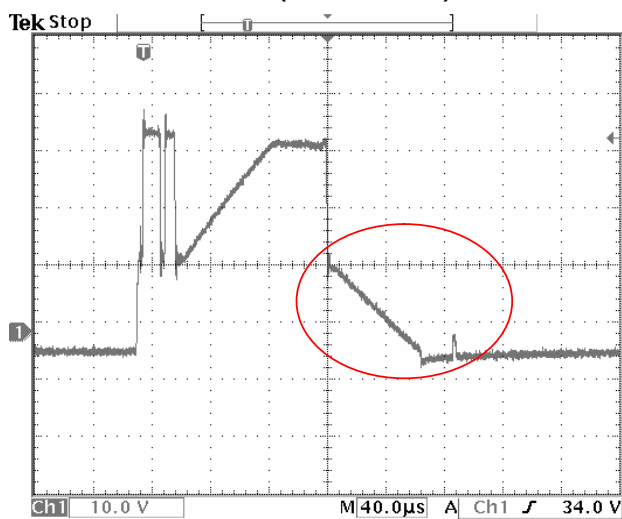
Very little alteration to the picture, the wave form indicates a distorted **Vset_UP**. The peak widens due to the **Vset_UP** peaking too quickly.

Vset_UP too low (27.3vdc)



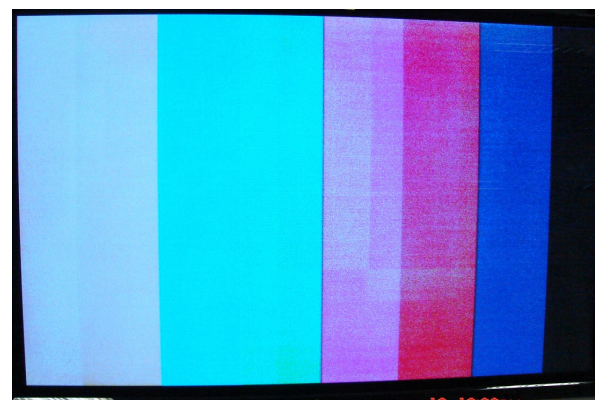
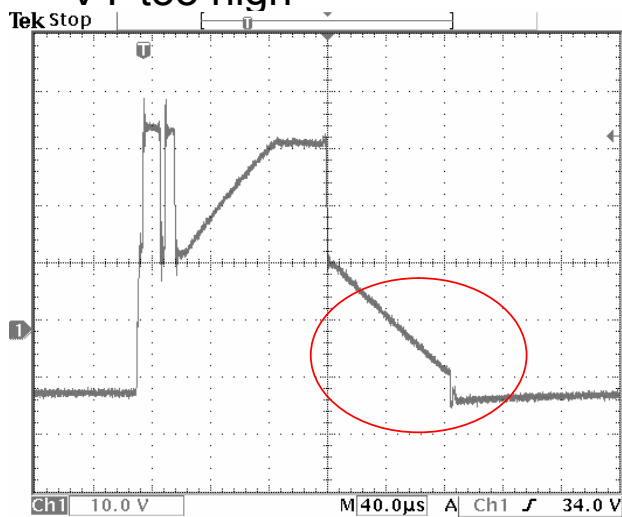
The center begins to wash out and ark due to **Vset_UP** Peeking too late and alters the start of the **Vset_DN** phase.

-VY too low (-154vdc)



Colors and the image will bloom slightly and the unit will have difficulty with clean frame changes in a quickly altering image.

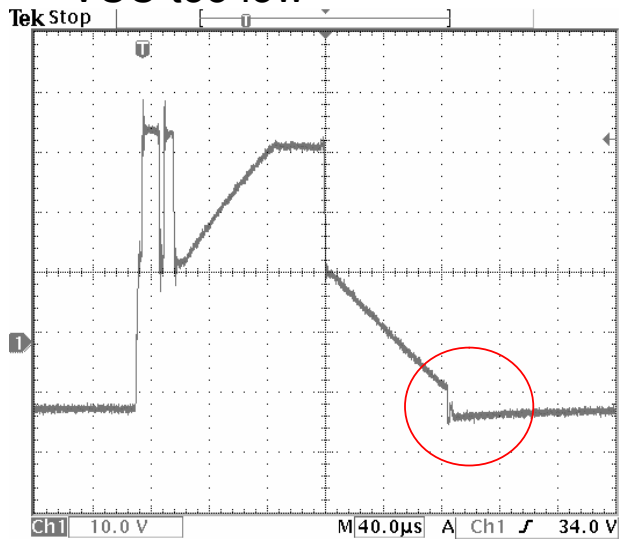
-VY too high



The center begins to wash out and ark due to **-VY** running to long and clipping.

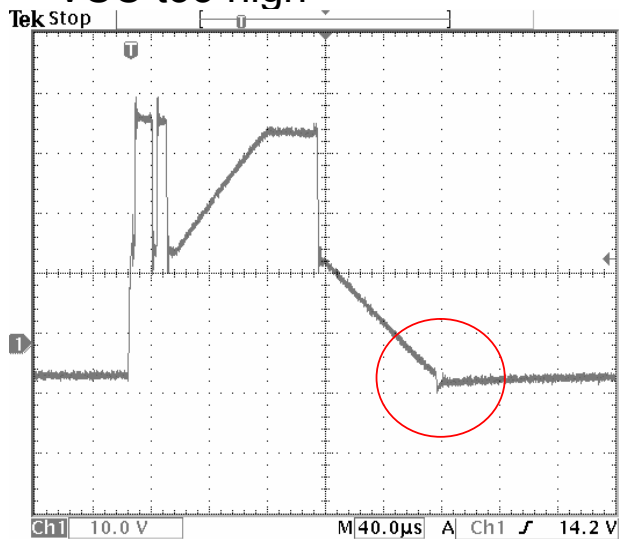
TROUBLESHOOTING

VSC too low

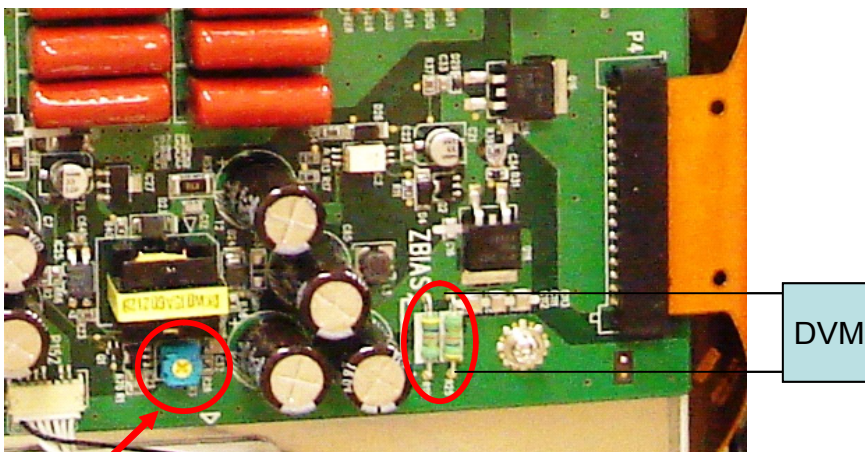


The image will show very little change but there will be some distortion in a quickly changing image.

VSC too high

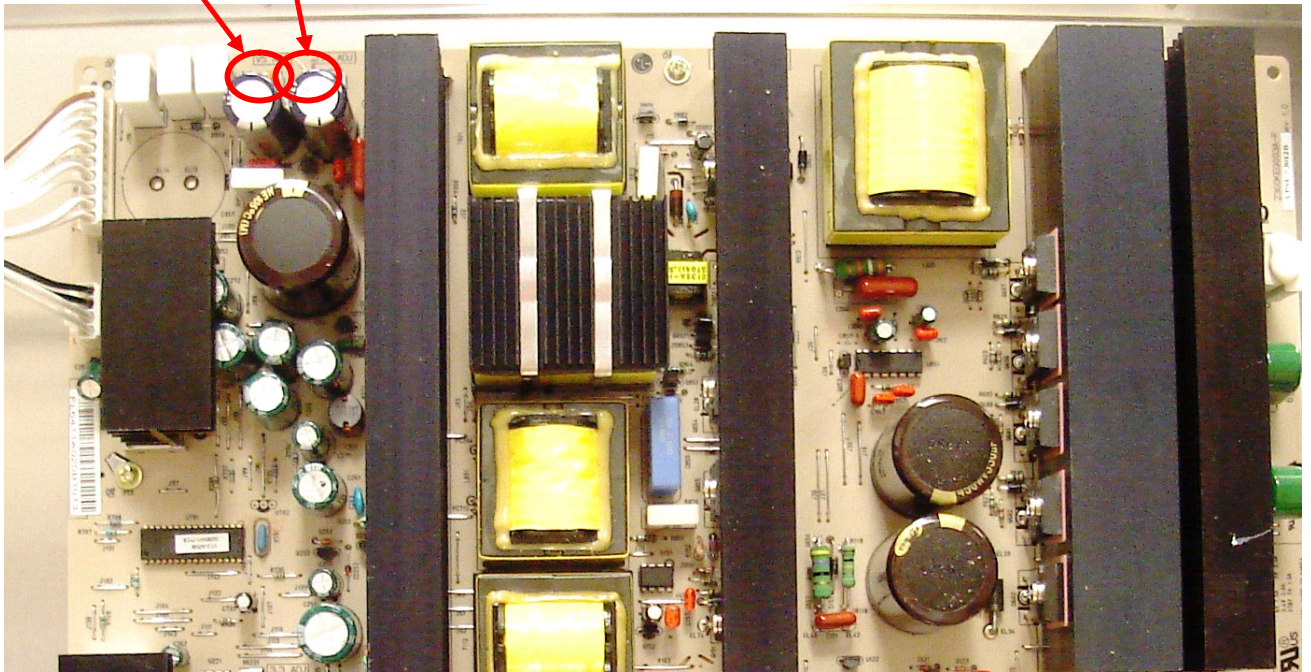


The image will show very little change but there will be some distortion in a quickly changing image.



ZBIAS adjustment: On the Z-Sustain PCB
With the DVM across R92 adjust the potentiometer till the DVM reads 93 vdc.

VS VA adjustments. Refer to the panel label for the correct setting



MEMORY CARD ERRORS

Message	Note
Unable to create folder. Reached maximum number of folders.	Maximum number of folder is 30.
Unable to create folder. No disk space.	HDD is full. Must delete a program/photo/music before record.
First stop copying and retry M/C eject.	Cannot eject while copy operation is in progress
Copy protected. Unable to copy.	Cannot copy to memory card because it is copy protected.
Not enough memory card space.	Cannot copy to memory card because free space is too small.
No memory card.	Memory card not detected
Unable to copy file.	Cannot copy
Unable to move file.	Cannot move
Unable to delete file.	Cannot delete
Unable to read file.	Cannot read
Unable to access. File or directory damaged.	Damaged file or memory card
Can't read data. Please remove memory card 1.	memory card 1 is not detected correctly
Can't read data. Please remove memory card 2.	memory card 2 is not detected correctly
Memory card 1 removed unsafely.	Must press eject button and select memory card before removing
Memory card 2 removed unsafely.	Must press eject button and select memory card before removing

DISASSEMBLY

PREPARATION

Prepare a clean surface with protective padding and place the unit face down on the surface. The area necessary to perform the panel replacement should equal approximately 4 times the panel size. Use extreme caution handling the unit to avoid damaging the front glass filter panel.

Tools required to complete the replacement:

- 1) Electric or cordless screwdriver with a #2 Phillips head screwdriver bit.
- 2) Digital Multimeter
- 3) Non magnetic potentiometer adjustment tool/blade
- 4) Diagonal cutters
- 5) Nylon cable ties

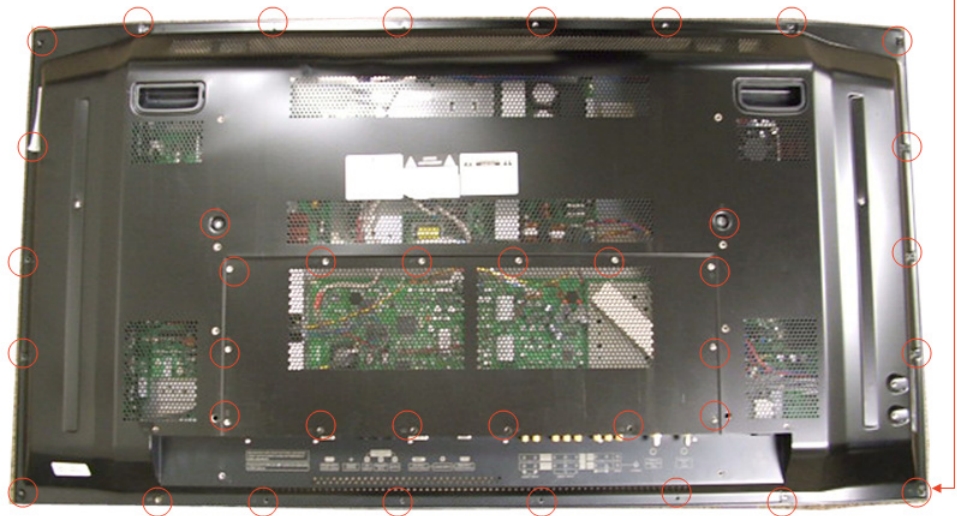
Note: Remember to observe ESD Safety precautions when handling electronic printed circuit boards and replacing the plasma display panel. Replace all cut cable ties with new ones to secure loose wires.

Note: The stand must be removed from the plasma TV/monitor before servicing.

DISASSEMBLY OF THE DU-42PX12X

REAR COVER REMOVAL

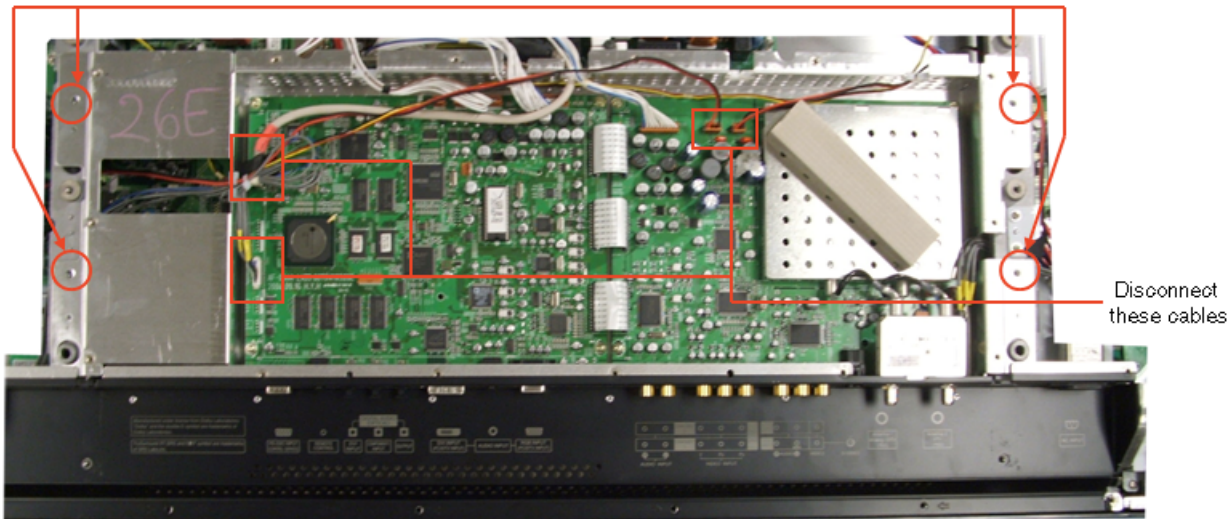
- 1) If you can not remember the connection locations, label each connector with a marker or use another method to identify the correct reconnect location.
- 2) Remove the rear cover screws. The arrows imprinted in metal rear cover indicate the screws that need to be removed to remove the rear cover.
- 3) Place the rear cover to the side. Place it in an area where it is protected from damage while unattached from the unit.



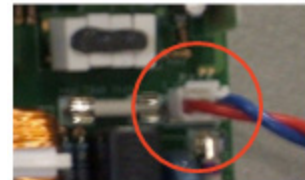
DISASSEMBLY

BOARD REMOVAL

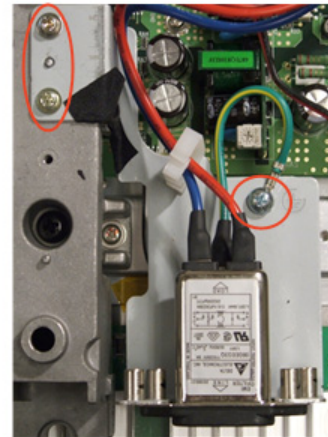
- 4) Remove the four (4) mounting screws used to secure the module housing containing the Digital and Analog boards.



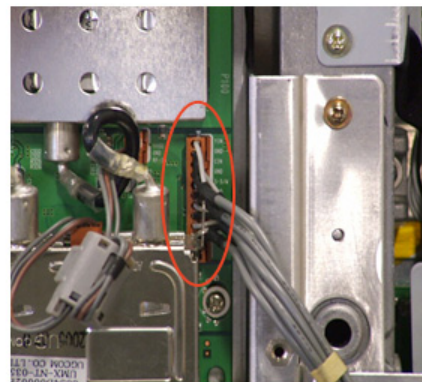
- 5) Disconnect the AC input to the power supply board, connector P801 and Main power switch board connector P802.



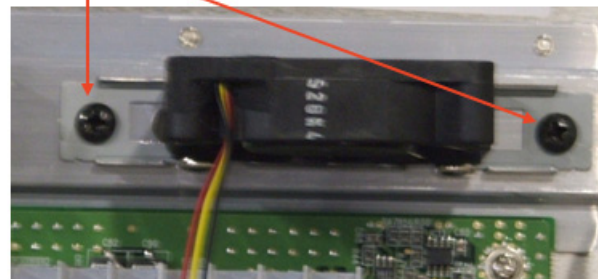
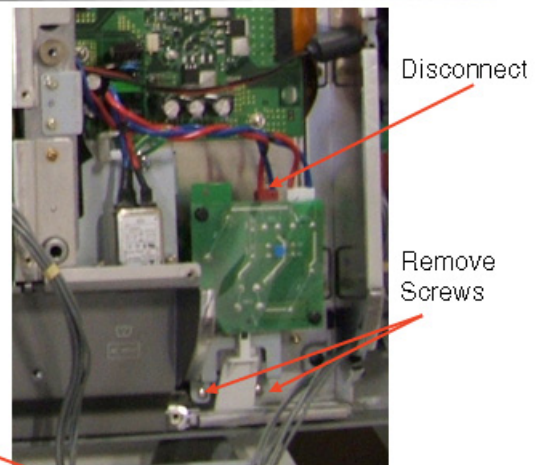
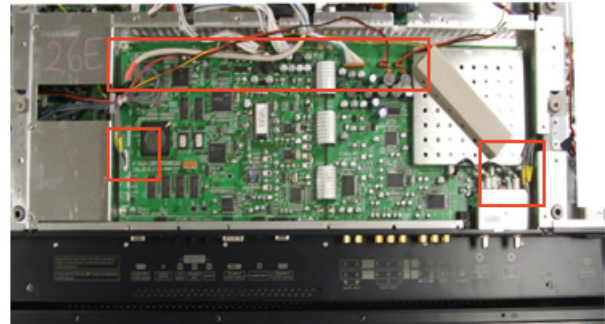
- 6) Remove mounting screws shown in the picture, to remove power cord socket.



- 7) Disconnect the Side-Audio Video cable from connector P100 of the Analog control board connection.



- 8) Disconnect the cables P203 and P204 they are the speaker connectors.
- 9) Disconnect the Fan power connectors P704 and P705.
- 10) Remove the black fiberglass tape securing cable connection P201, and disconnect the cable.
- 11) Disconnect P801, P802, and P803 from the power supply board.
- 12) Disconnect the cable from connector P300 on the digital board. Leave the cable attached to connector P807 of the power supply board.
- 13) Remove the complete signal board assembly as a single piece.
- 14) Set the assembly aside. Place it in an area where it is protected from damage while unattached from the unit.
- 15) Disconnect the cables from the Y-Sustain board, P151, that connect to the power supply connectors P805 and P804. Retain the cables to reuse. New cables are not provided.
- 16) Disconnect the cables from the Z-Sustain board, P151, that connect to the power supply connector P806. Retain the cables to reuse. New cables are not provided.
- 17) Remove two (2) mounting screws shown to remove the Main Power switch from the cabinet. Remove the power switch from the cabinet assembly.
- 18) Remove the eight (8) mounting screws from the Power Supply board and remove the board from the panel.
- 19) Place the power Supply module aside after removal, observing all ESD (Electro-Static Discharge) precautions.
- 20) Disconnect the data cable from connector P201 located on the digital board mounted on the panel. Retain the cable to reuse. New cables are not provided.
- 21) Remove the left cooling fan mounted on the defective panel mounting bracket by, removing the (2) screws on each side of the fan.

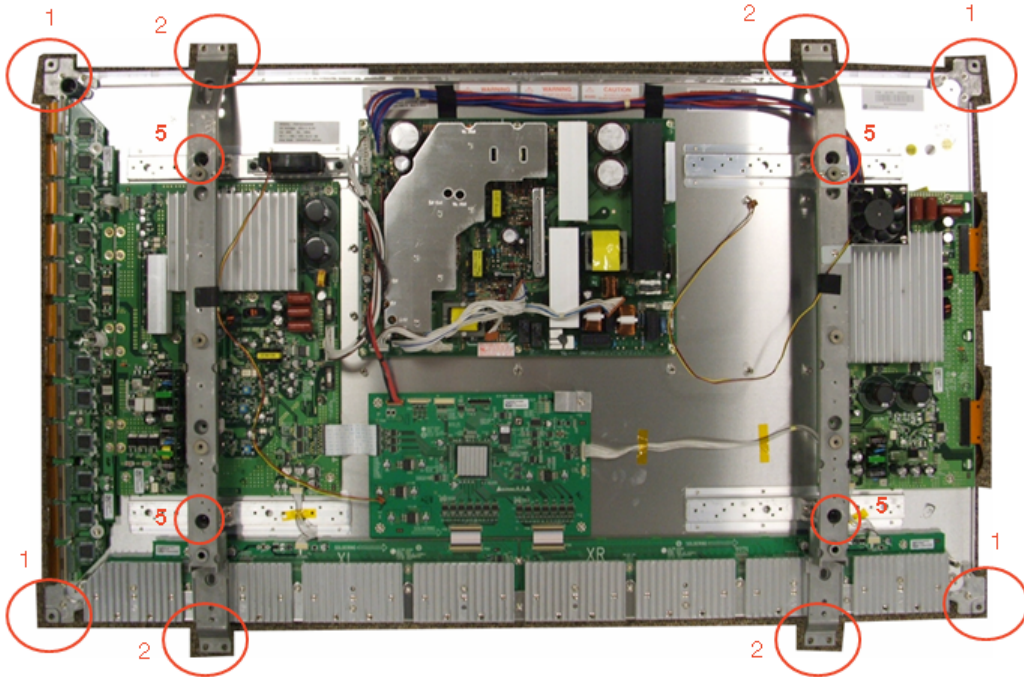


DISASSEMBLY

PANEL REMOVAL

At this point, replace the panel if it has been determined to be defective and replacement is necessary.

- 1) Remove the four (4) screws that retain the panel to the front cabinet assembly.
- 2) Remove the support rails screws indicated. Removing these screws will release the panel from the cabinet.



- 3) Using the support rails, lift the defective panel up and out of the cabinet.
- 4) Place the panel on a flat *padded* surface away from the cabinet.
- 5) Remove the two (2) bolts fastening each support rail to the back of the defective panel. The right side support rail has a cooling fan attached to it. It can remain attached through the removal from the defective panel and re-installation to the placement panel.

INSPECT REPLACEMENT PANEL

Upon receiving the replacement panel, it must be inspected to ensure that it has arrived in good condition. The following items should be observed to ensure that no shipping damage has occurred.

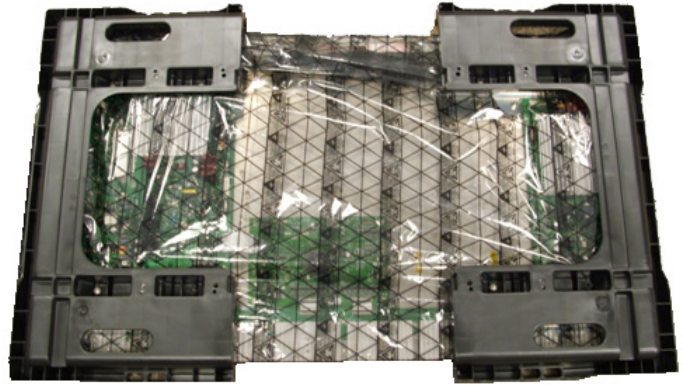
- 1) Check the outer carton for damage, and report it upon receipt of the replacement panel.
- 2) Confirm the part number on the carton label is the part number that was ordered or expected.
- 3) If the carton has arrived undamaged, open the carton after receipt, and check the contents for damage or broken part.
- 4) Confirm the replacement panel in the carton matches the part number on the outer carton.
- 5) If everything is correct and un-damaged, the panel replacement process can continue at this point.



INSTALL REPLACEMENT PANEL

Preparing the new panel for installation is the same process as removal of the defective panel, but it is performed in reverse.

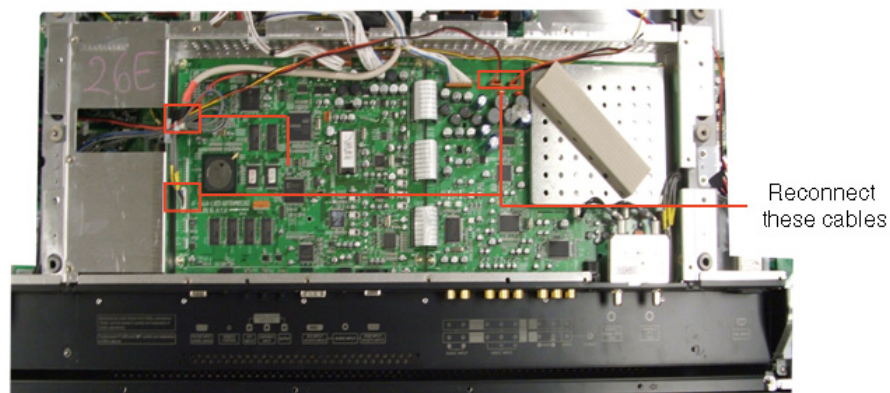
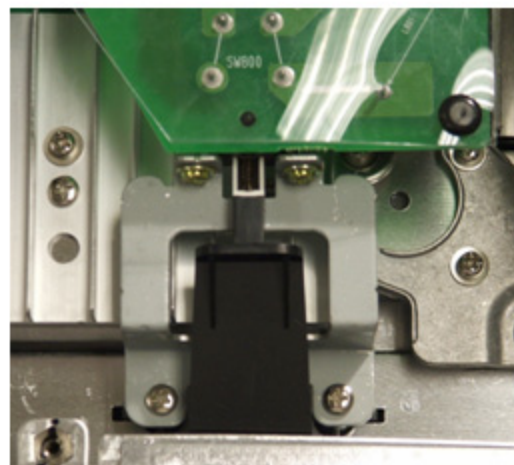
- 1) Remove the new panel from the carton it was received in, and place the panel on an elevated surface. The protective material connected to the panel must be removed. The panel must be elevated approximately 2 inches to remove the protective ends.
- 2) Remove the four (4) bolts indicated and lift the end caps off of the panel.
- 3) Remove the tape holding the plastic wrap around the panel and pull the wrap back exposing the panel and it's circuit boards.
- 4) Re-install the support brackets on the replacement panel.
- 5) Secure the panel to the cabinet with the four (4) screws removed in earlier steps. Install the eight (8) screws that secure the support brackets to the front cabinet assembly. Use extreme caution installing the screws, to prevent stripping the screw holes and causing further delays.
- 6) Re-install the cooling fan on the left side of the panel.
- 7) Re-install the Power Supply board on the replacement panel. Install the eight (8) mounting screws to secure the board to the panel backing.
- 8) Re-connect the cables from the power supply connectors P804 and P805 to the Y-Sustain board connector P151.
- 9) Re-connect the cables from the power supply connector P806 to the Z-Sustain board connector P151.
- 10) Locate the Digital board cable that was removed from the connector P501 on the Digital VSC board, and connect it to P501 on the Digital board that is already mounted on the replacement panel. Position the cable so that is accessible, and can be attached to P201 of the Digital VSC board later.



DISASSEMBLY

INSTALL THE DIGITAL VSC BOARD

- 1) Locate the assembly shown, and place it back on the support rails of the unit. Place the assembly in the correct location so that the screw holes line up correctly.
- 2) Install the four (4) screws in the frame securing it to the support rails.
- 3) Reconnect the cable from the Side Audio/Video jack inputs to connector P100 on the Analog/Tuner board.
- 4) Reconnect the front control board cable to the Digital VSC board connector P103.
- 5) Reconnect the Left side fan cable connector to the connector P704 located on the Digital VSC board. Connect the Right side cooling fan connector to connector P705 on the Digital VSC board.
- 6) Reconnect the speaker cables to the Analog/Tuner board connector P203 and P204. Connect the left speaker to connector P203, and the right speaker cable to connector P204.
- 7) Reconnect the cable from the digital board connector P501, to the Digital VSC board connector P201.
- 8) Reconnect the cable from Digital VSC board connector P706 to the Power Supply connector P801.
- 9) Reconnect the cable from Digital VSC board connector P701 to the Power Supply connector P802.
- 10) Reconnect the cable from Analog/Tuner board connector P201 to the Power Supply connector P803.
- 11) Reinstall retaining screws that secure the AC Power connector to the right support rail.



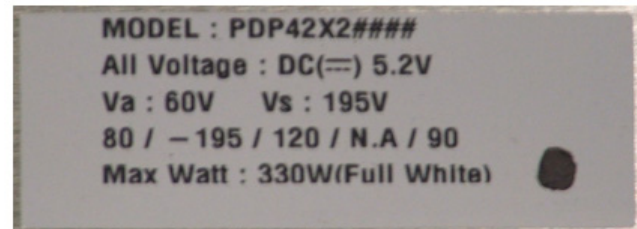
- 12) Reinstall the Main Power switch into the cabinet assembly using the two (2) screws that were removed from the bracket during disassembly.
- 13) Reconnect the Power Switch cable connected to P801 to the power supply connector P810. Connect the AC input cable socket wire leads to connector P802 of the power switch.
- 14) Use the nylon cable ties to secure all loose wiring. Inspect wiring for any pinched or damage insulation and repair or replace if necessary.

This process completes the installation of the panel. The unit is ready to have AC power applied to the set. The power supply Vs and Va run voltages must be checked and adjusted to the panel specifications. The correct voltage settings are notated on an adhesive label placed on the backside of the panel.

VS AND VA VOLTAGE ADJUSTMENT

- 1) Apply power to the unit and turn it on. If the unit does not operate correctly, check all connections and look for loose wires that may have been missed or that have become disconnected during the reassembly process.
- 2) Allow the unit to run for 5 minutes. This is to allow the set to achieve operating temperature before checking the Vs and Va run voltages. This step should be completed before making adjustments to Vs and Va voltages.
- 3) Connect the positive (+) terminal lead of the digital multimeter to the Va pin of connector P805 and connect the negative (-) terminal lead of the digital multimeter to the ground (GND) pin of P805.

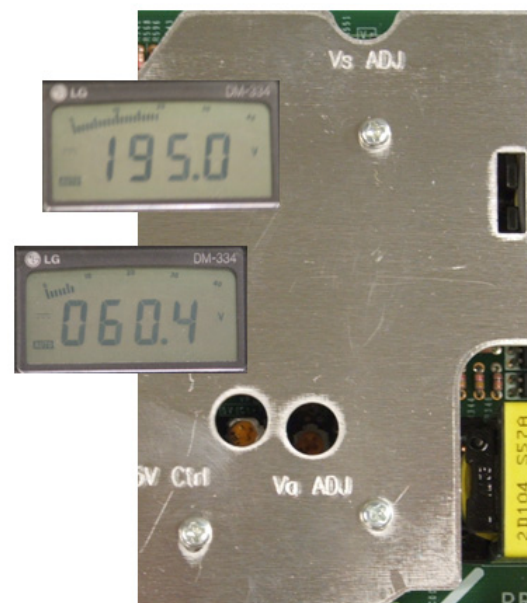
- 4) Adjust variable resistor VR351 to match the Va voltage specification shown on the label attached to the panel. (Deviation: $\pm 0.5v$)



- 5) Connect the positive (+) terminal lead of the digital multimeter to the Vs pin of connector P805 and connect the negative (-) terminal lead of the digital multimeter to the ground (GND) pin of P805.

- 6) Adjust variable resistor VR551 to match the Va voltage specification shown on the label attached to the panel. (Deviation: $\pm 0.5v$)

- 7) After confirming the Vs and Va run voltages, the set is ready to reassemble.



DISASSEMBLY

DISASSEMBLY OF THE 2DR MODELS

These instructions refer to the 50PY2DR and 60PY2DR

TOOLS REQUIRED

- 1) Electric or cordless screwdriver with a #2 Phillips head screwdriver bit.
- 2) Digital Multi-meter
- 3) Non magnetic potentiometer adjustment tool / blade
- 4) Diagonal cutters
- 5) Nylon cable ties

Note: Remember to observe ESD Safety precautions when handling electronic printed circuit boards and replacing the plasma display panel. Replace all cut cable ties with new ones to secure loose wires.

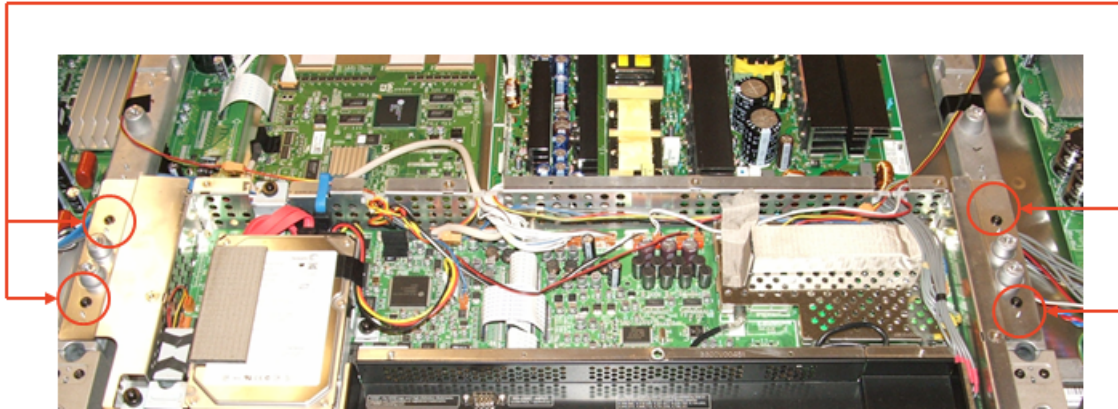
Note: The stand must be removed from the plasma tv / monitor before servicing.

REAR COVER

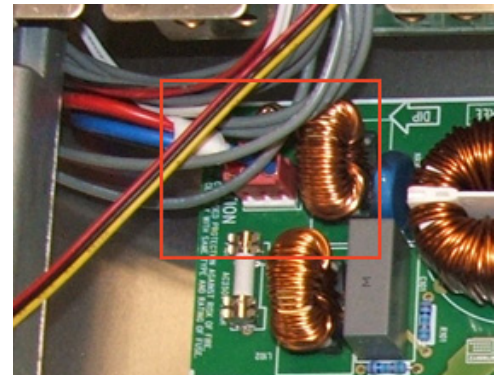
- 1) If you can not remember the connection locations, label each connector with a marker or use another method to identify the correct reconnect location.
- 2) Remove the rear cover screws. The arrows imprinted in metal rear cover indicate the screws that need to be removed to remove the rear cover.
- 3) Place the rear cover to the side. Place it in an area where it is protected from damage while unattached to the unit.



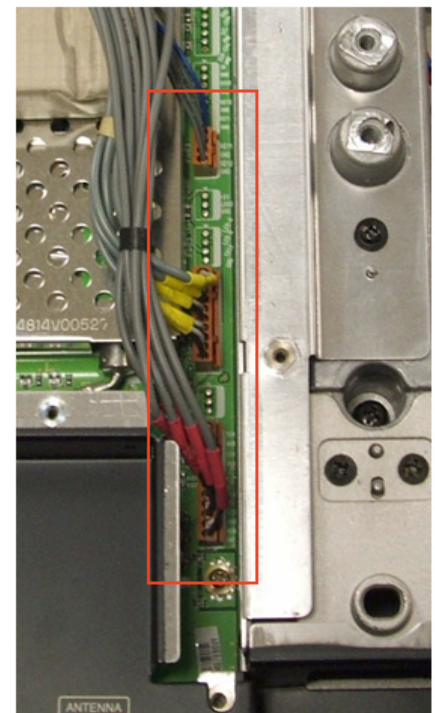
- 4) Remove the four (4) mounting screws, used to secure the module housing containing the Digital and Analog boards.



- 5) Disconnect the AC input to the power supply board, connector PN1B.

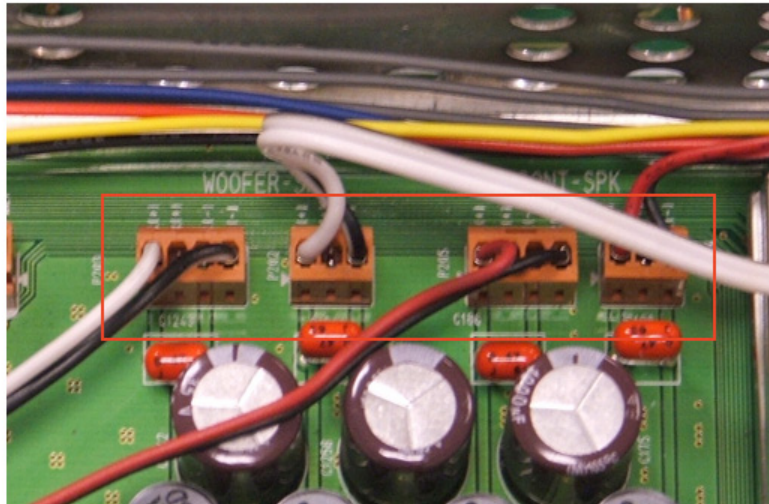


- 6) Disconnect the Side-Audio Video cable from connector P100, of the Analog control board connection.

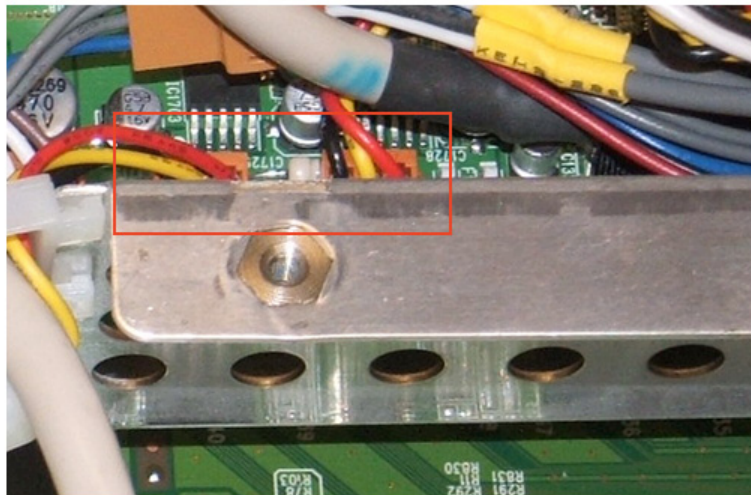


DISASSEMBLY

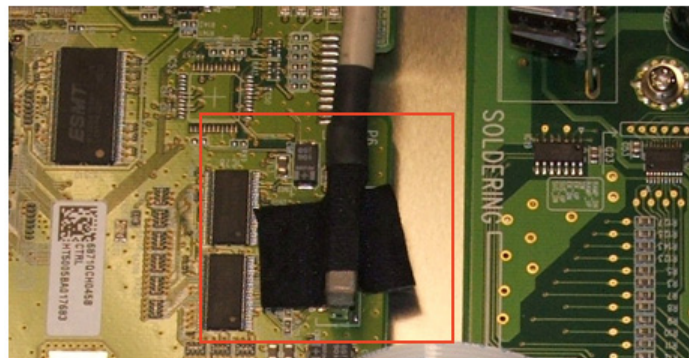
- 7) Disconnect the cables P202, P203, P204 and P205, they are the speaker connectors.



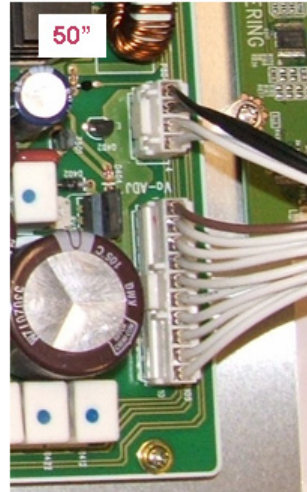
- 8) Disconnect the Fan power connectors, CN1701, CN1702, and CN1703.



- 9) Remove the black fiberglass tape securing cable connection CN1300, and disconnect the cable.



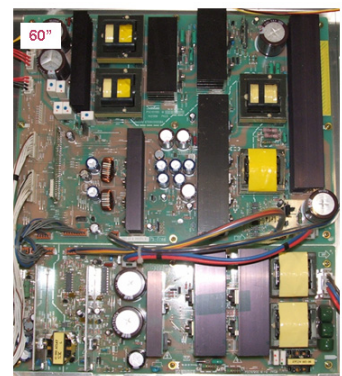
- 10) Disconnect P802, P803, P804 and P805 from the power supply board.



- 11) Remove the complete signal board assembly, as a single piece.
12) Set the assembly aside. Place it in an area where it is protected from damage while unattached to the unit.



- 13) Disconnect the cables from the Y-Sustain board P3 and P4, that connect to the power supply connector P805 and P804. Retain the cables to reuse. New cables are not provided.
14) Remove the eight (8) mounting screws from the Power Supply board and remove the board from the panel. Remove secondary power supply at the same time.
15) Place the power Supply module aside after removal, observing all ESD (Electro-Static Discharge) precautions.



PANEL REMOVAL

- 1) Remove the eight (8) screws that retain the panel and support rails to the front cabinet assembly.
- 2) Remove the support rail screws indicated. Removing these screws will release the panel from the cabinet.
- 3) Using the support rails, lift the defective panel up and out of the cabinet.
- 4) Place the defective panel on a flat padded surface away from the cabinet.
- 5) Remove the four (4) bolts fastening each support rail to the back of the defective panel.



INSPECT REPLACEMENT PANEL

At this point if the panel has been determined to be defective an replacement is necessary. Upon receiving the replacement panel, it must be inspected to ensure that it has arrive in good condition. The following items should be observed to ensure that no shopping damage has occurred.

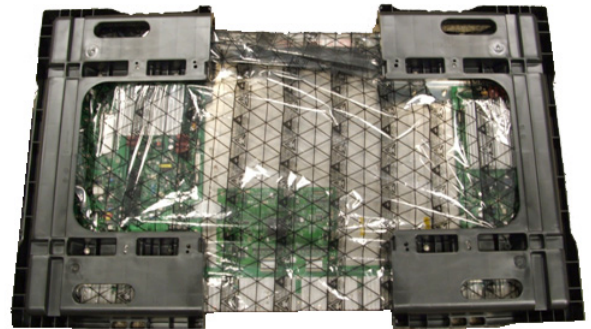
- 1) Check the outer carton for damage, and report it upon receipt of the replacement panel.
- 2) Confirm the part number on the carton label is the part number that was ordered or expected.
- 3) If the carton has arrived undamaged, open the carton after receipt, and check the contents for damage or broken parts.
- 4) Confirm the replacement panel in the carton matches the part number on the outer carton.
- 5) If everything is correct and un-damaged, the panel replacement process can continue at this point.



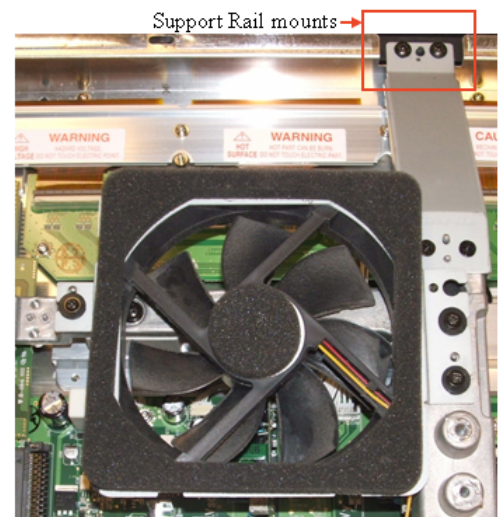
INSTALL REPLACEMENT PANEL

Prepare a clean surface with protective padding and place the unit face down on the surface. The area necessary to perform the panel replacement should equal approximately 4 times the panel size. Use extreme caution handling the unit to avoid damaging the front glass filter panel.

- 1) Remove the new panel from the carton it was received in, and place the panel on an elevated surface. The protective material connected to the panel must be removed. The panel must be elevated approximately 2 inches to remove the protective ends.
- 2) Remove the four (4) bolts indicated and lift the end caps off of the panel.
- 3) Remove the tape holding the plastic wrap around the panel and pull the wrap back exposing the panel and it's circuit boards.
- 4) Re-install the support brackets on the replacement panel.
- 5) Secure the panel to the cabinet with the eight (8) screws removed in earlier steps. Install the eight (8) screws that secure the support brackets to the front cabinet assembly. Use extreme caution installing the screws, to prevent stripping the screw holes and causing further delays.
- 6) Re-install the Power Supply boards on the replacement panel. Install the sixteen (16) mounting screws to secure the board to the panel backing.
- 7) Re-connect the cables from the power supply connectors P804 and P805 to the Y-Sustain board connector P3.
- 8) Locate the Digital board cable that was removed from the connector CN1300 on the Digital VSC board, and connect it to P30 on the Digital board that is already mounted on the replacement panel. Position the cable so that is accessible, and can be attached to CN1300 of the Digital VSC board later.

**RE-INSTALL DIGITAL VSC BOARD AND ANALOG TUNER BOARD**

- 1) Locate the assembly shown, and place it back on the support rails of the unit. Place the assembly in the correct location so that the screw holes line up correctly.
- 2) Install the eight (8) screws in the frame securing it to the support rails as shown.
- 3) Reconnect the cable from the Side Audio / Video jack inputs to connector P101, and P106 on the Analog / Tuner board.
- 4) Reconnect the front control board cable to the Analog board connector P403.
- 5) Reconnect the fan cables connections to the connectors CN1701, CN1702 and CN1703 located on the Digital VSC board.
- 6) Reconnect the speaker cables to the Analog / Tuner board connector P202, P203 P204 and P205.



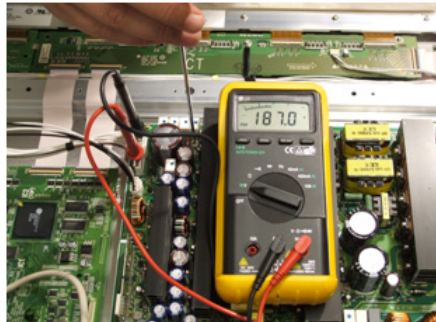
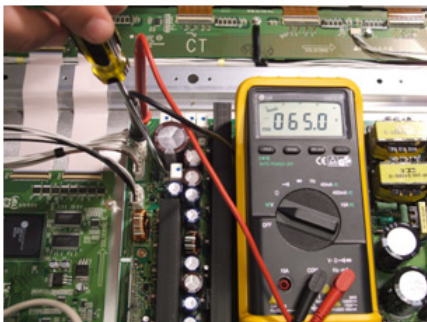
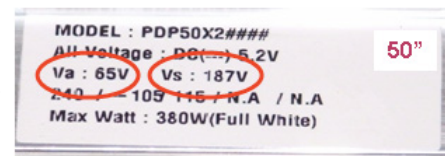
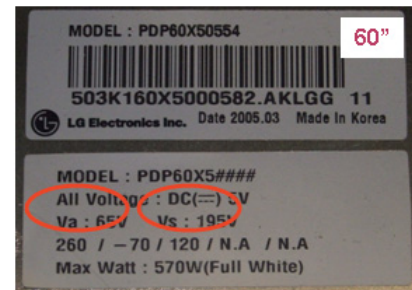
DISASSEMBLY

- 7) Reconnect the cable from the digital board connector P301, to the Digital VSC board connector CN1300.
- 8) Reconnect the cable from Digital VSC board connector CN1700 to the Power Supply connector P803.
- 9) Reconnect the cable from Analog / Tuner board connector P201 to the Power Supply connector P802.
- 10) Reconnect the control panel cable to the Analog Tuner board P408 and P403, on the 60" model. The 50" model only has connector
- 11) Use the nylon cable ties to secure all loose wiring. Inspect wiring for any pinched or damage insulation and repair or replace if necessary.

This process completes the installation of the panel. The unit is ready to have AC power applied to the set. The power supply Vs and Va run voltages must be checked and adjusted to the panel specifications. The correct voltage settings are notated on an adhesive label placed on the backside of the panel.

VS AND VA VOLTAGE ADJUSTMENT

- 1) Apply power to the unit and turn it on. If the unit does not operate correctly, check all connections and look for loose wires that may have been missed or that have become disconnected during the reassembly process.
- 2) Allow the unit to run for 5 minutes. This is to allow the set to achieve operating temperature before checking the Vs and Va run voltages. This step should be completed before making adjustments to Vs and Va voltages.
- 3) Connect the positive (+) terminal lead of the digital multi-meter to the Va pin of connector P805 and connect the negative (-) terminal lead of the digital multi-meter to the ground (GND) pin of P805.
- 4) Adjust variable resistor RV501 to match the Va voltage specification shown on the label attached to the panel. (Deviation: $\pm 0.5v$)
- 5) Connect the positive (+) terminal lead of the digital multi-meter to the Vs pin of connector P805 and connect the negative (-) terminal lead of the digital multi-meter to the ground (GND) pin of P805.
- 6) Adjust variable resistor RV401 to match the Vs voltage specification shown on the label attached to the panel. (Deviation: $\pm 0.5v$)
- 7) After confirming the Vs and Va run voltages, the set is ready to reassemble.

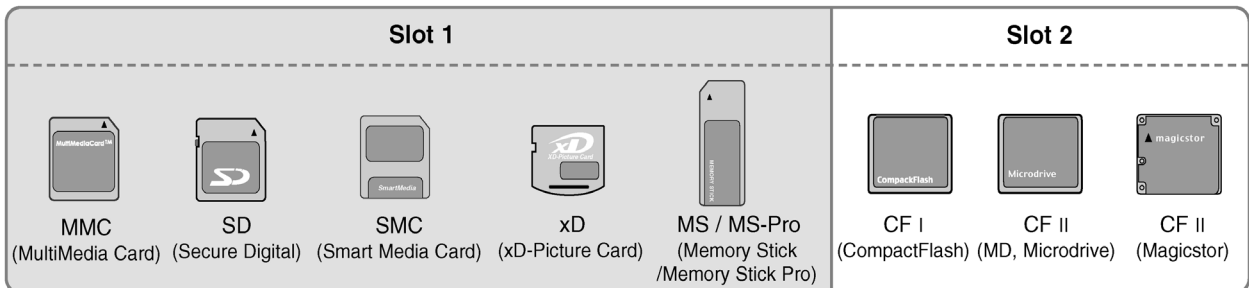


SOFTWARE UPDATES

UPDATES VIA MEMORY CARD

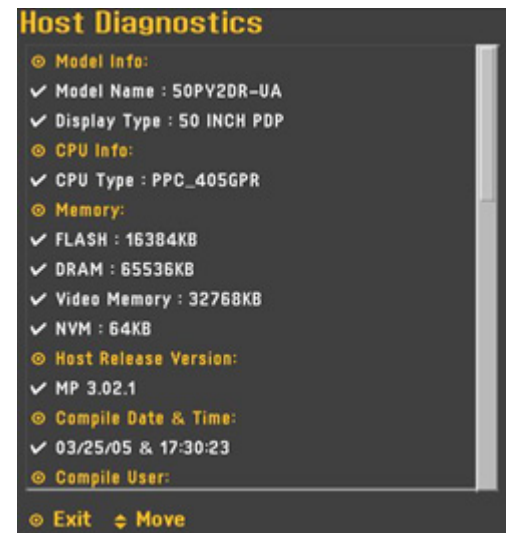
Firmware can be updated using a memory card on newer PDP TVs that feature a memory card reader. When a memory card is inserted, the TV will look for any firmware updates located on the card. If it doesn't find an update newer than the version on the TV, it displays the normal media menu for displaying photos or playing music from the card.

Supported memory cards:



CHECK HARDWARE VERSION

Before updating the firmware, check the hardware version to be sure it will support the firmware you wish to install. If there are any hardware requirements, the documentation with the firmware will list them. To open the diagnostics screen, highlight the Cable icon in the user menu and then press the zero 0 button three times.



The software version can also be obtained by pressing the IN-START button on a service remote.



SOFTWARE UPDATES

FIRMWARE SPECIAL REQUIREMENTS

For some firmware releases, there are different versions for different model revisions. Check the model suffix of the TV to determine which update to use. You will find the suffix on the back of the TV next to "Product Code". Make sure you use the correct file when doing any updates.

UPDATE INSTRUCTIONS - NORMAL METHOD

- 1) Copy the Firmware update to the memory card. This has already been done for you if the card came from LG Customer Service. The firmware file will have the file extension ".epk". Only copy the firmware update for your model TV.
- 2) Turn the TV on and insert the memory card into the TV. If the firmware on the card is newer than the firmware in the TV, the following will be shown:

Current TV Software version: 3.08 (date: 5/5/2005)
The following new software is found in the memory card.
File: 42LP1DU_V313_rom.epk
- Main Software: 3.13

- 3) Press ENTER on the remote to begin the firmware update. The TV will restart automatically and show the progress of the update. **Do not remove the memory card or remove power from the TV until complete.**

Reading the file...Done
Main Software: Upgrading...22 Percent

- 4) The TV will show the following messages when the firmware update is complete:

Reading the file...Done
Main Software: Upgrading...Done

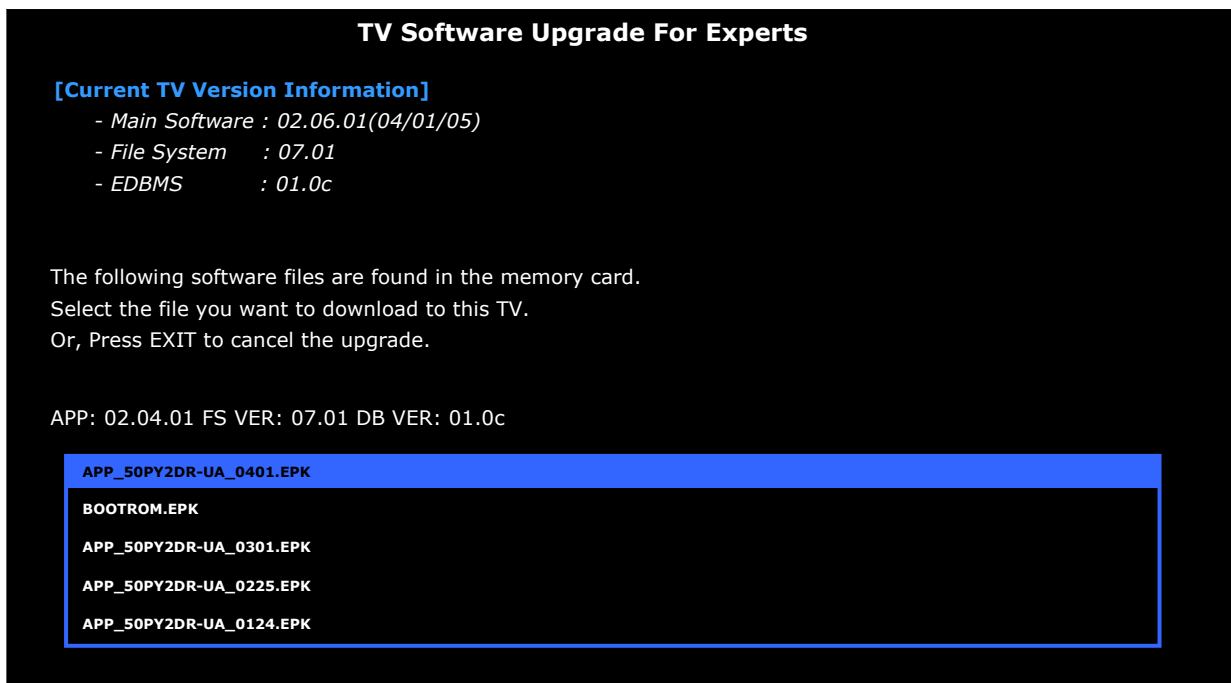
The software upgrade has been successfully completed.
Press ENTER to restart the TV now.
The TV will restart automatically in 14 seconds.

- 5) Press ENTER. After restarting, the TV is ready to use.

UPDATE INSTRUCTIONS - EXPERT METHOD

Expert Mode will allow any firmware version on the card to be loaded into the TV. This allows an older version of the firmware to be loaded when needed.

- 1) Copy the Firmware update to the memory card. The firmware file will have the file extension ".epk". Only copy the firmware update for your model TV.
- 2) Turn the TV on and insert the memory card into the TV.
- 3) If a menu displays on the screen, exit out of that screen. Press the MENU button and highlight (scroll down to) the Option menu. Press the MARK button 7 times and the expert mode screen will appear.



- 4) Use the arrow keys to select the firmware update to install. Press OK and follow the prompts.
- 5) When the update is complete, press ENTER to restart the TV. After restarting, the TV is ready to use.

SOFTWARE UPDATES

FIRMWARE UPDATES VIA SERIAL CABLE

USING THE TERATERM SOFTWARE

There are currently two methods used to update the firmware on LG PDPs using TeraTerm. The most common is listed first. Refer to the Service Bulletin for which method should be used. Both require a null modem cable.

Note: Not all female to female serial cables are null modem cables. Null modem cables will have some type of marking on them like "NM"...or actually have "Null Modem" stamped on them.

INSTRUCTIONS FOR MOST PDPS (AND LCDS)

1. If you have already TeraTerm software and if the software works on your laptop, go to step 5.
2. If you don't have TeraTerm software, download TeraTerm software from:
<http://www.tucows.com/preview/195282.html>
3. Unzip the file (TeraTerm) from above site.
4. Install TeraTerm software on your computer.
5. Unplug the power on the TV set.
6. Turn your laptop PC on.
7. Connect null modem cable between laptop computer and TV sets using serial port.
8. Execute "TeraTerm" software in your laptop computer
9. "Serial Port" on TeraTerm Go to "Setup"
10. Set the port number of your Laptop (Usually 1 or 2), Baud rate "115200", Data "8 bit", Parity "none", Stop "1bit", Flow control "none", Transmit delay "0 msec/char 0msec/line", and click "OK". (If you don't have any serial port on your laptop, you need a USB to serial cable connector. You can get one from a computer store.)
11. Keep pressing the "1" key on your laptop's keyboard and plug in the power on the TV.
12. Once power is on the TV set, release the "1" key on your laptop's keyboard after you see the message (release "1" key) on your laptop.
13. Type "1" on your laptop's keyboard and hit "enter" key. "Send file" on TeraTerm.
14. Go to "File"
15. Check "binary" in the small box at the bottom of the screen..
16. Select appropriate file for downloading.
17. Hit "enter" key on the laptop's keyboard.
18. Wait for download completion
19. After download completion, the TV set will automatically turn off and on. If not, unplug the power on the TV set and reapply power.
20. Download procedure is done!!

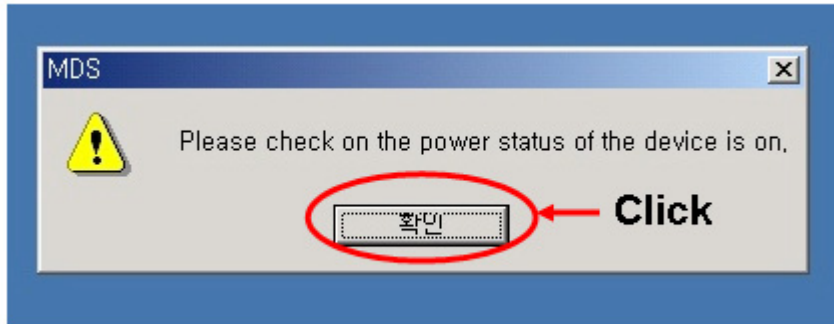
ALTERNATE DOWNLOAD INSTRUCTIONS

1. Turn on your laptop PC
 2. Connect a null modem serial cable between laptop computer and TV.
 3. Turn on TV.
 4. Change baud rate of TV to "115200" using instart key on "adjust remocon"
 5. Execute "TeraTerm" software in your laptop computer.
 6. Go to "Setup" then "Serial Port" in TeraTerm.
 7. Set the port number of your Laptop (Usually 1 or 2), Baud rate "115200", Data "8 bit", Parity "none," Stop "1bit," flow control "none," Transmit delay "0 msec/char 0msec/line," and click "OK,"
 8. Press the enter key several times to check the laptop communication with the TV. If the cursor moves down, the laptop is communicating with TV.
 9. Type the model # (This has to be the factory model #)
 10. Hit "d" on your laptop keyboard and hit "enter" key on your laptop keyboard
 11. Hit "f0" (F and Zero) on your laptop keyboard and hit "enter" key on your laptop keyboard
- NOTE: Read the items in the menu. They may differ by model and production series, thus f0 is correct for some models but not others. Just keep in mind you are using a serial port and wanting to upgrade the firmware.*
12. Hit "10" (1 and Zero) on your laptop keyboard and hit "enter" key on your laptop keyboard.
- NOTE: Read the items in the menu. They may differ by model and production series, thus 10 is correct for some models but not others. Just keep in mind you are using a serial port and wanting to upgrade the firmware.*
13. Go to "File" then "Send file" on TeraTerm Select the file "DU42PY 10X rom.img" for downloading.
 14. Hit "enter" on the laptop's keyboard.

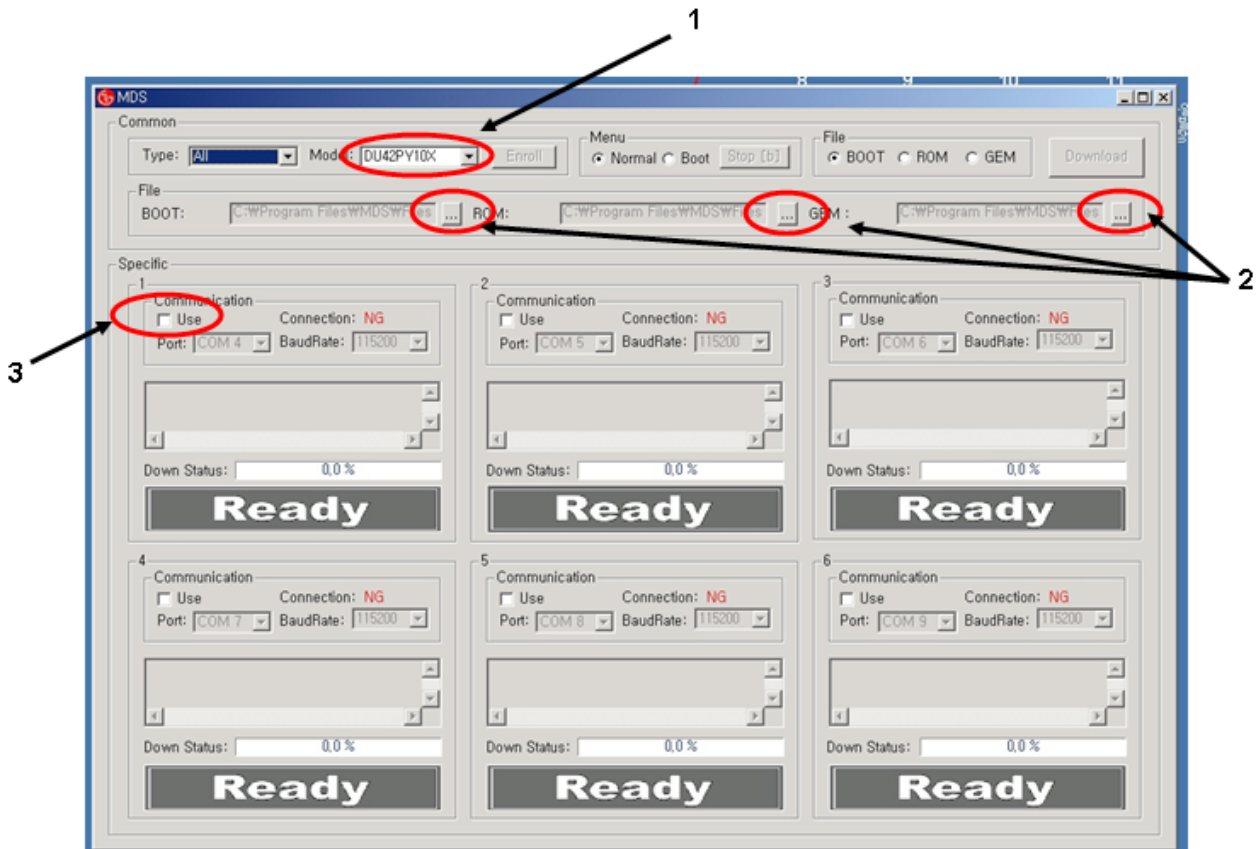
SOFTWARE UPDATES

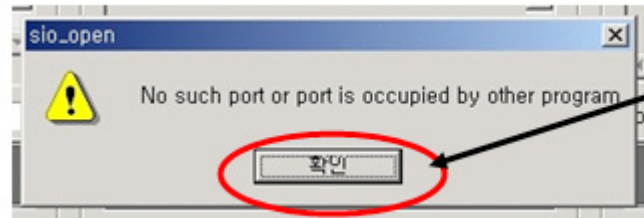
FIRMWARE UPDATES VIA MDS

- 1) Start > Program > MDS > MDS Click
 - * Press power on the service remote before you start the MDS program.

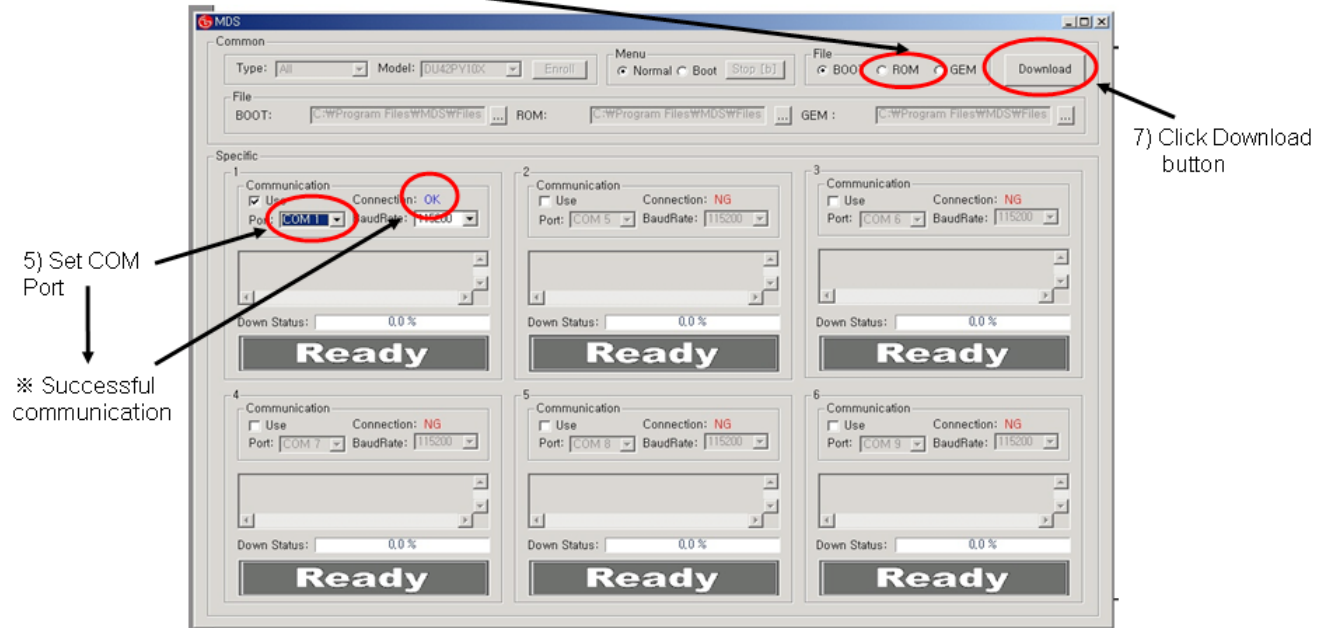


- 2) Click on OK.
- 3) Item 1 below Select Correct Model
- 4) Item 2 below Open Browse & Select source file (ROM) is usually the only file needed to upgrade the software.
- 5) Item 3 below click this box to select this communication port.

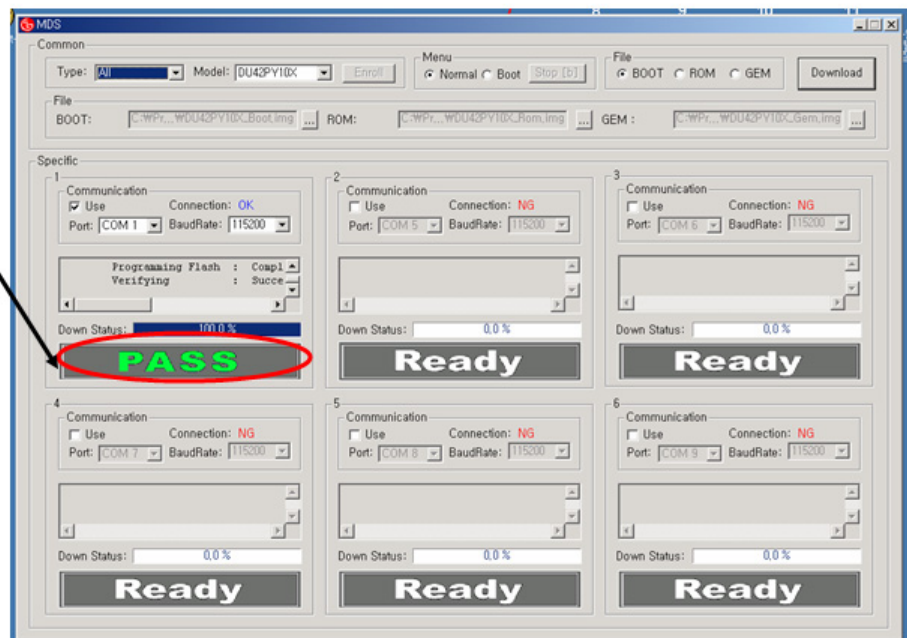




6) Select download file & download step by step Only the ROM file is needed



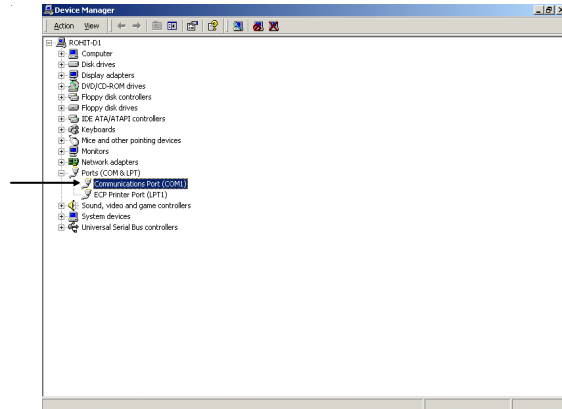
8) You can see "PASS" when the download finished. Use the Instart key to verify the software version changed.



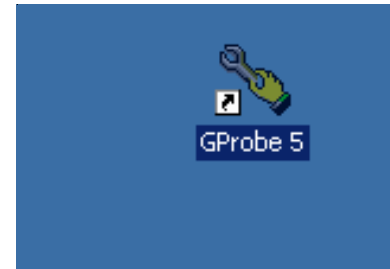
SOFTWARE UPDATES

USING LGIDS AND GPROBE

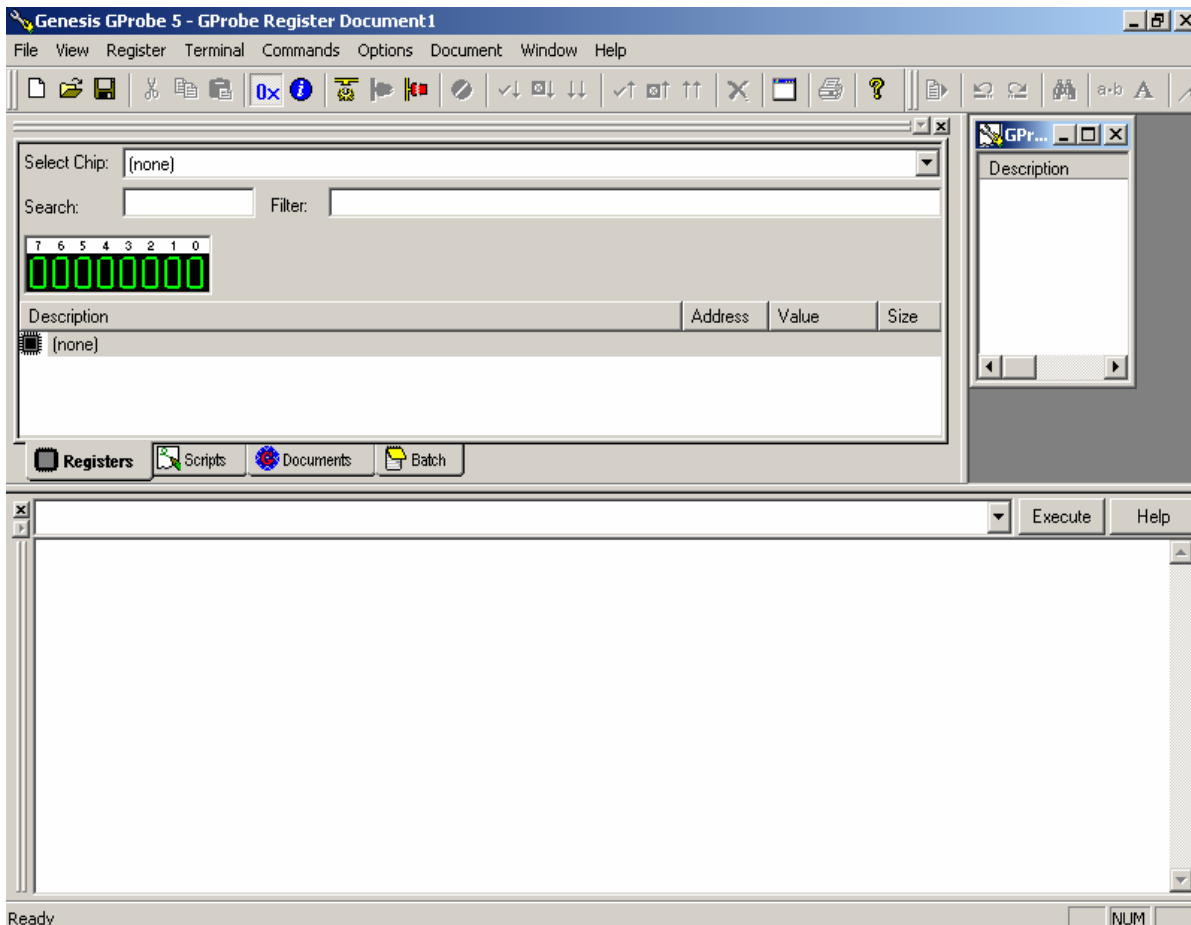
1. On your desktop right click on My Computer or access My Computer from the start menu.
2. Left click on Properties.
3. Left click on the Hardware tab.
4. Left click on (Device Manager...) Check the Availability of Serial Port under "Ports" as Communications Port (COM1) as shown in the figure.



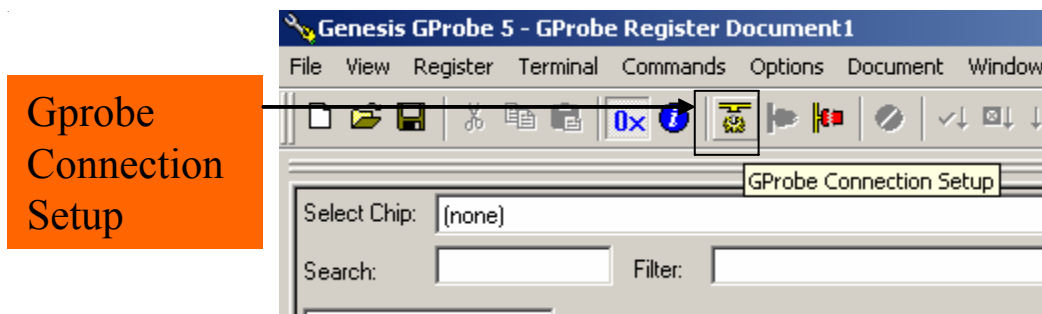
1. After downloading the program from GCSC. Install \42PM1M-42PM3MV\GProbe5.1.0.18.exe
2. Run the EXE file and the install process will begin and an icon will be placed on your desktop.
3. GProbe5 can be use by double clicking on the icon as shown in the figure.



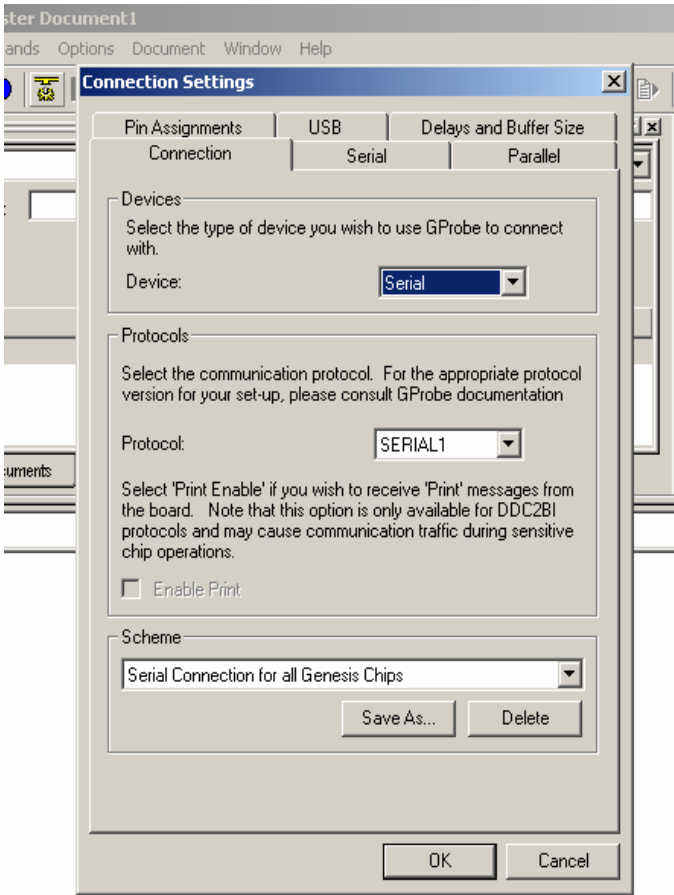
Opening GProbe will appear as below:



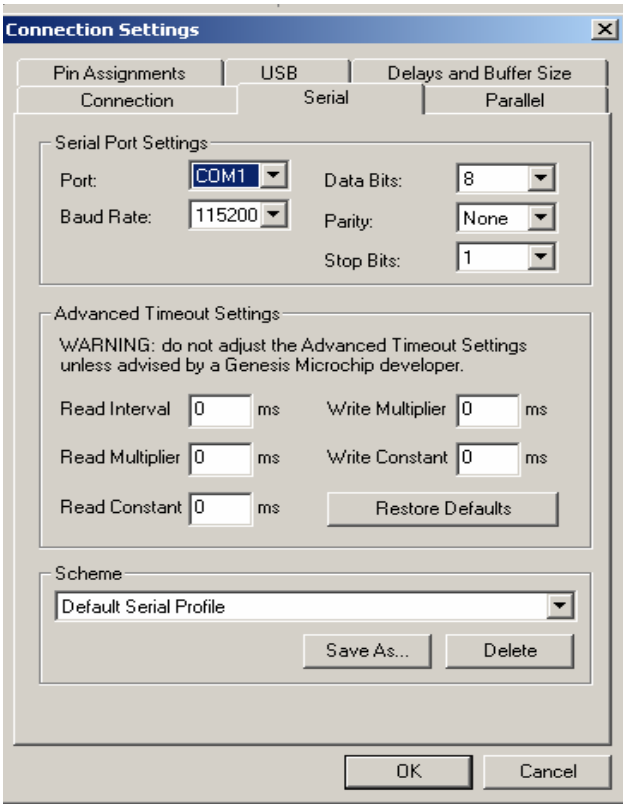
Select the GProbe connection by clicking the icon as below:



Left click on the Connection Settings icon and check the settings tab for Port under "Connection Tab" as shown in figure.



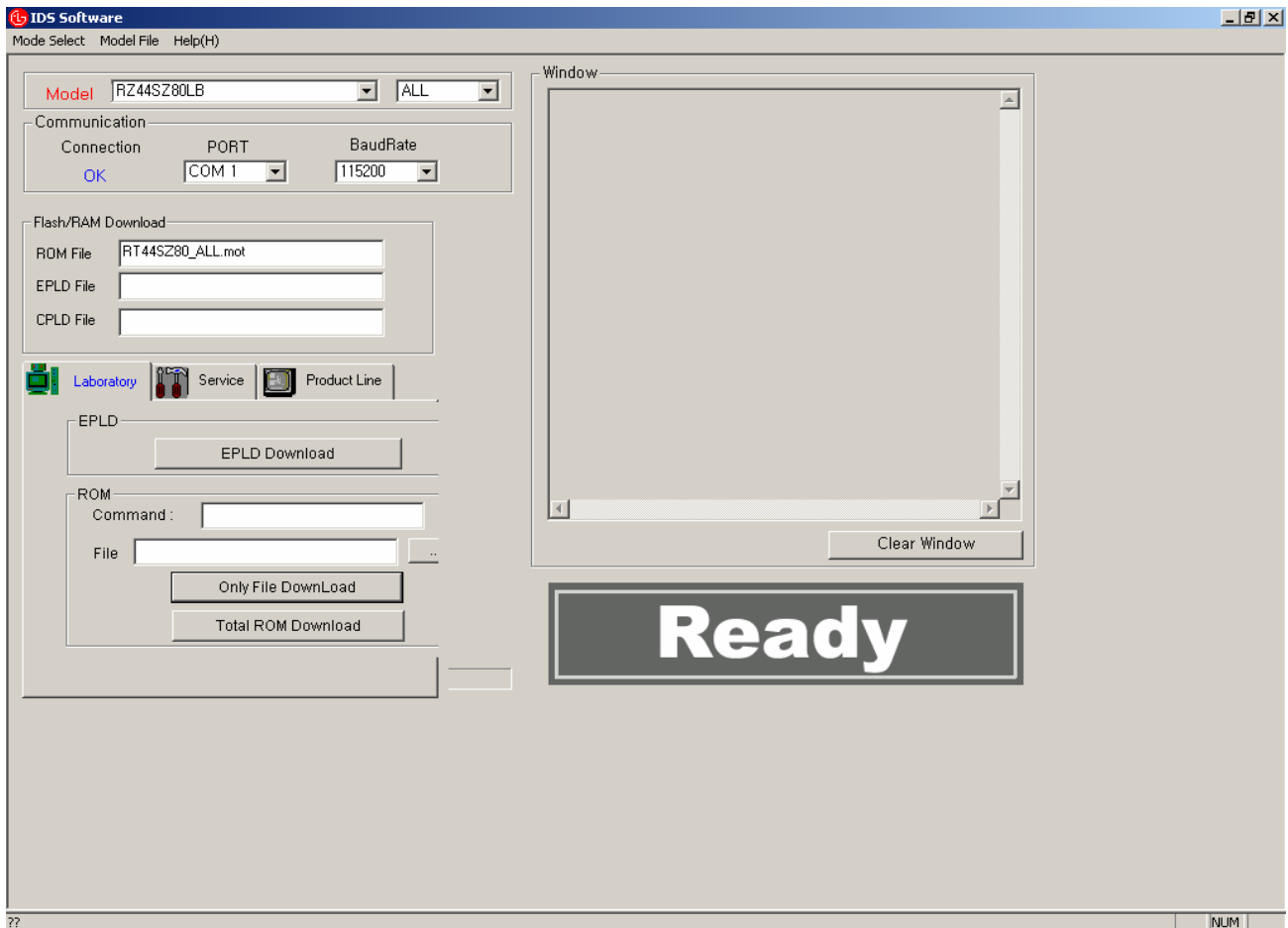
Click the Serial tab for checking other configurations as shown in figure. Port: COM1, Baud Rate: 115200.



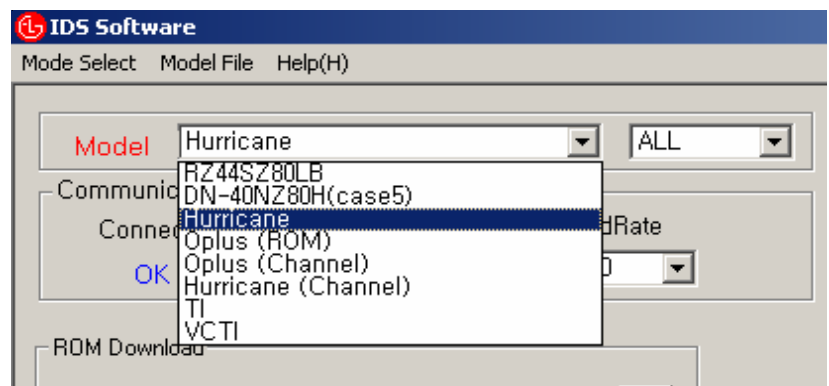
Install \42PM1M-42PM3MV\LGIDS_Ver[1].83\Setup.exe. After successful installation create the shortcut on the desktop by clicking on Start, scroll up to programs, move the cursor to the right and scroll till you see (LGIDS), to the right you will see



. When you right click on this icon scroll up to (Send To) and left click on the (Desktop (create shortcut)). You will now have a link on your desktop to the LGIDS software. . When you open this program you will see.

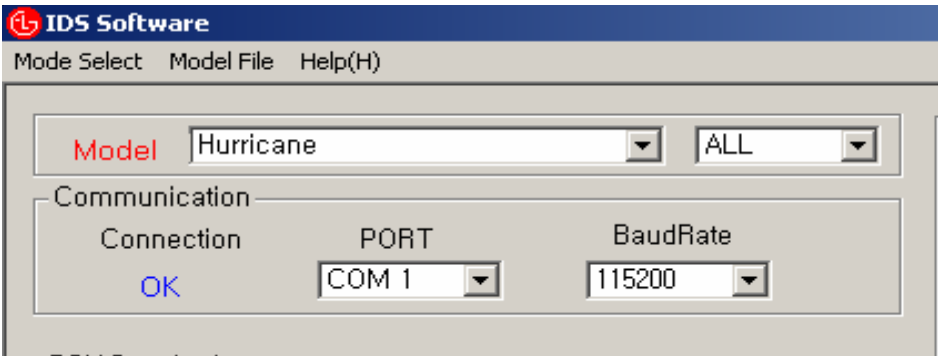


Now select the new configurations.
Model: In this case it is Hurricane as shown in the figure.

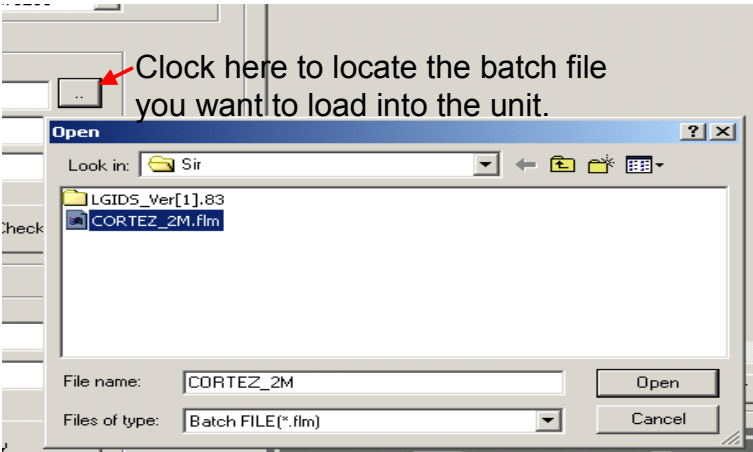


SOFTWARE UPDATES

If "COM1Port" is connected it will display the message under Communication as:
 Connection Port: COM1
 Baud Rate: 115200



Now select the new configurations.
 ROM Download: Batch file : CORTEZ_2M.flm as shown in the figure.
 Follow this same procedure with the Ram and Flash files.
 After locating the path of all the three files (Batch, Ram and Flash), set the unit up as shown.



Press Tilt Key from SVC Remocon and click on Download for successful download of software in TV.
 After Successful downloading of the software in the TV:

Switch Off Main Power Supply to the T.V Sets for more than 5 seconds and again Switch On the Main Power Supply, TV is in Standby mode(D.C Power Off).

Press Power Key from SVC Remocon to turn the TV on.
 Press ADJ Key from SVC Remocon for Software Version Check.

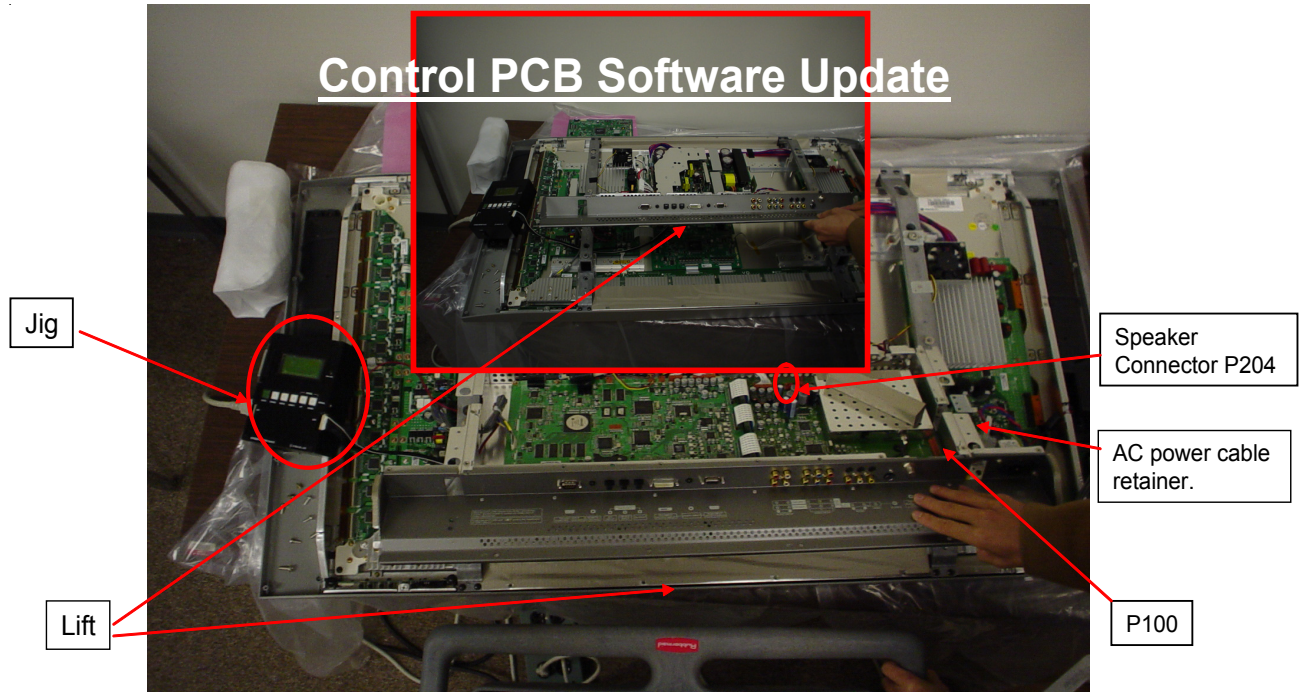
42PM1M_UC_Ver3.06.....
 42PM3MV_UC_Ver3.04

Now Press IN-STOP key on the SCV Remocon to complete the Job.

MF – 056A	
Cortez Version	3.21
Hudson Version	3.19
Panel Used	2 Hr.
Tool Option	41
Area Option	20
Option1	106
Option2	23
Option3	2
Option4	128
System Control	
Panel Control	
Screen Control	
Fan Control	
BlkLine Detector	
Power-off History	
XSTUDIO Control	

System Control	
System	4 - SYS
OverScan	5 %
OrbitPixel	2
Orbit Step	2
OrbitTime	120 Sec.
Inv. Time	30 Min.
RS-232 Host	Gprobe
Baud Rate	115200 bps

CONTROL PCB SOFTWARE UPDATE

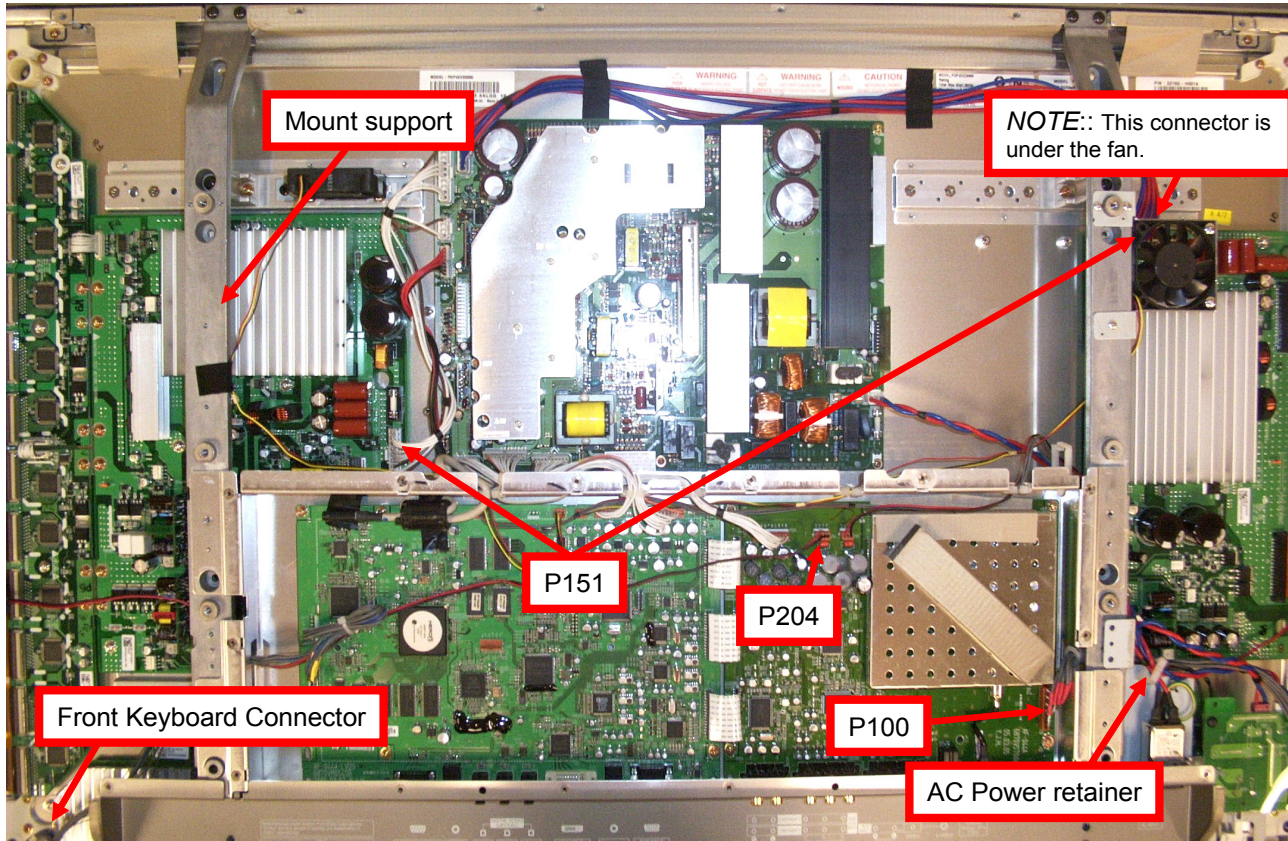


- Once the back has been removed.
- Remove the screws holding the Digital/Tuner PCB assembly and AC power switch to the TV.
- Disconnect P151 from Z-Sus and P151 from Y-Sus.
- Remove the AC power cable from the retainer.
- Disconnect the cable to the front keyboard assy.
- Lift the lower end of VSC/Tuner PCB assembly up after disconnecting P100 from the tuner PCB and the speaker P204 from the tuner PCB.
- Route the cable from the jig to the control PCB under the mount support and connect it to P101 (found in the upper left by the power connector) on the control PCB.
- Connect the other end to the EPP port on the jig with the jig OFF.
- Keep the jig away from any PCB to prevent damage to the jig or the PCB.

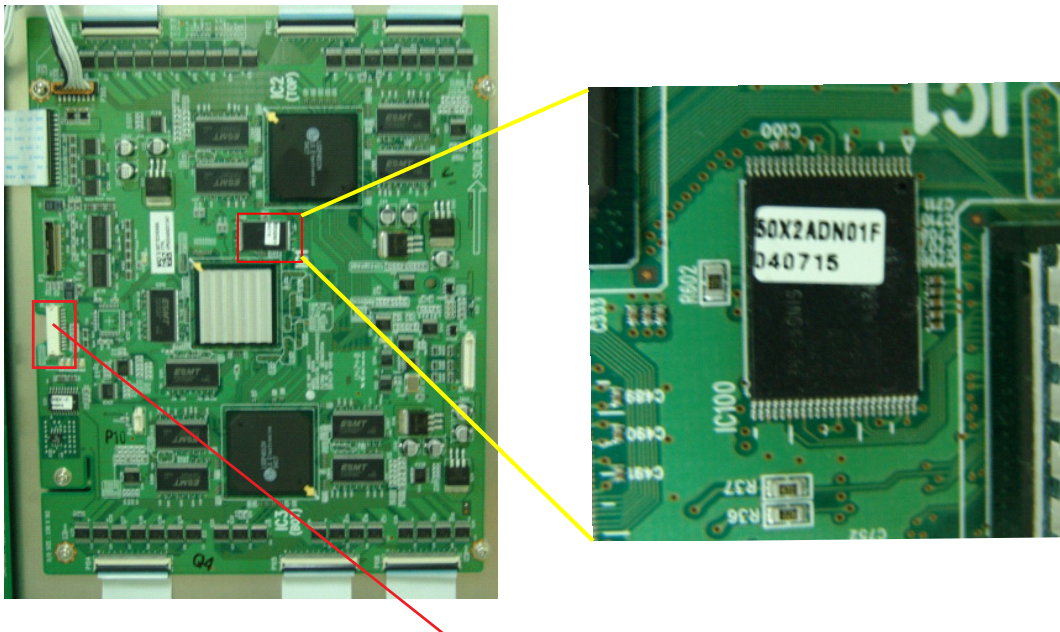
NOTE:

To Acquire this jig call technical support for model and problem evaluation. This jig will have to be returned to LG.

SOFTWARE UPDATES

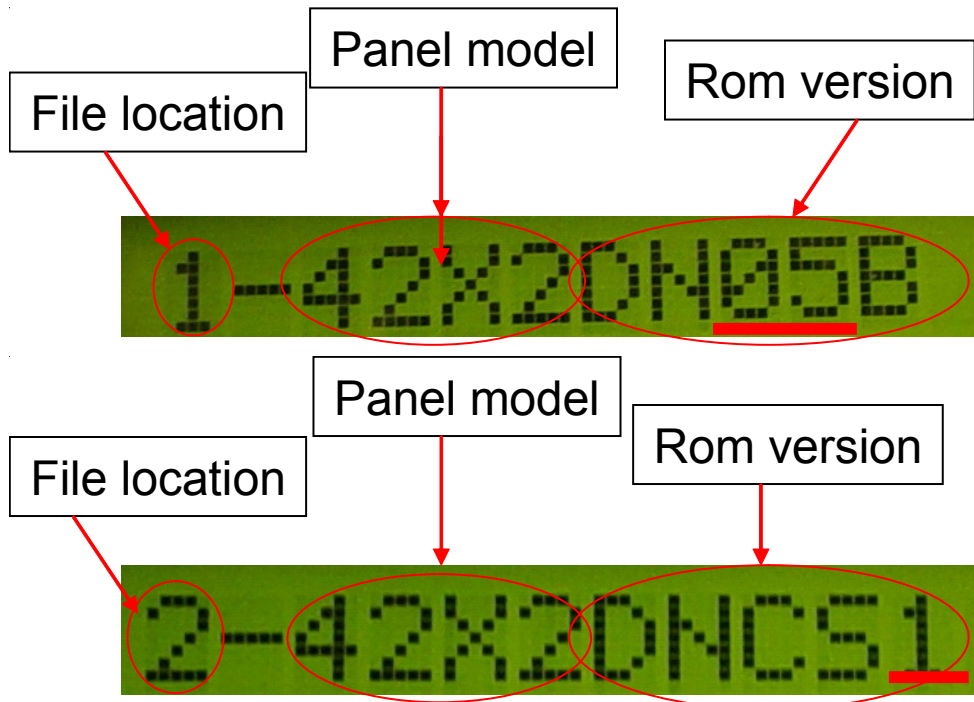


Selecting the correct file



Connect the cable from the jig here on the control PCB.

This ID will be found on a label on the Control PCB. Be sure the panel model you select on the jig matches the label on the control board. Verify that the version you have in the jig is a later version than what is on the label. EX: 05B would be later than 05A or 04X.

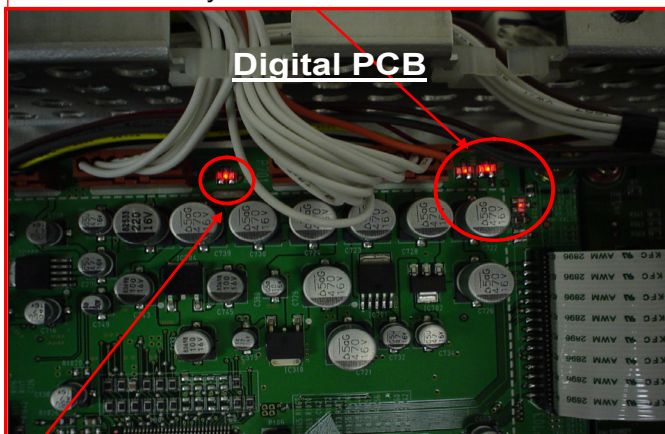


The File location will not appear on the label on the control PCB.

- Turn the power to the jig ON
- Use the MODEL up or down to select the correct file.
 - *To use the MODEL up/down keys. Press either key for 3 seconds and release the key, you will see the model id disappear and only the number will be shown in the upper left.
 - *Quickly use the up/down keys to scroll to the file in location number 1. The file will load after a few seconds. The file name (42X2DN05B) appears in the screen on the jig.

NOTE: To use any key on the jig you must hold the key down for at least 3 seconds.

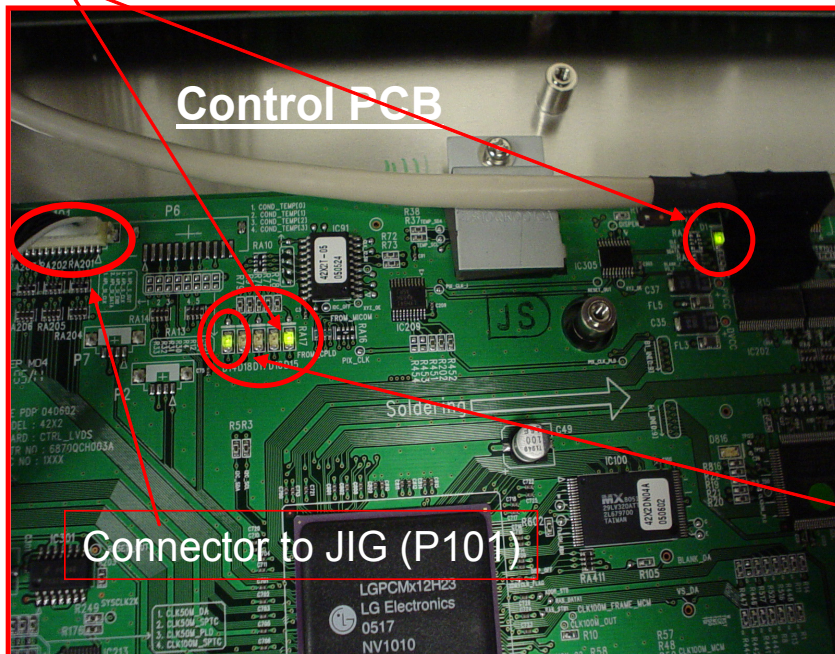
- Apply AC power to the jig with the switch on the jig OFF and apply AC to the TV. Only one LED will be lit.



- Press the main AC power switch to the ON position on the TV. These additional LED's will be lit. If the TV is in the ON state when you connect AC, the unit will turn itself on. Turn on the jig.

SOFTWARE UPDATES

- When the TV is in the ON state these additional LED's will be lit.



This LED will be blinking

What will be seen during the update.

```
1-42X2DN05B
Mem=833A EPP000s
```

Press and hold the (AUTO) button for 3 seconds and release the (AUTO) button.

```
1-42X2DN05B
Mem=833A EPP003s
Erasing....
```

Within a few seconds the display will indicate (ERASING) and the LED will be flashing green.

```
1-42X2DN05B
Mem=833A EPP006s
DownLoading..
```

The display will next display (WRITING) and the LED will be blinking.

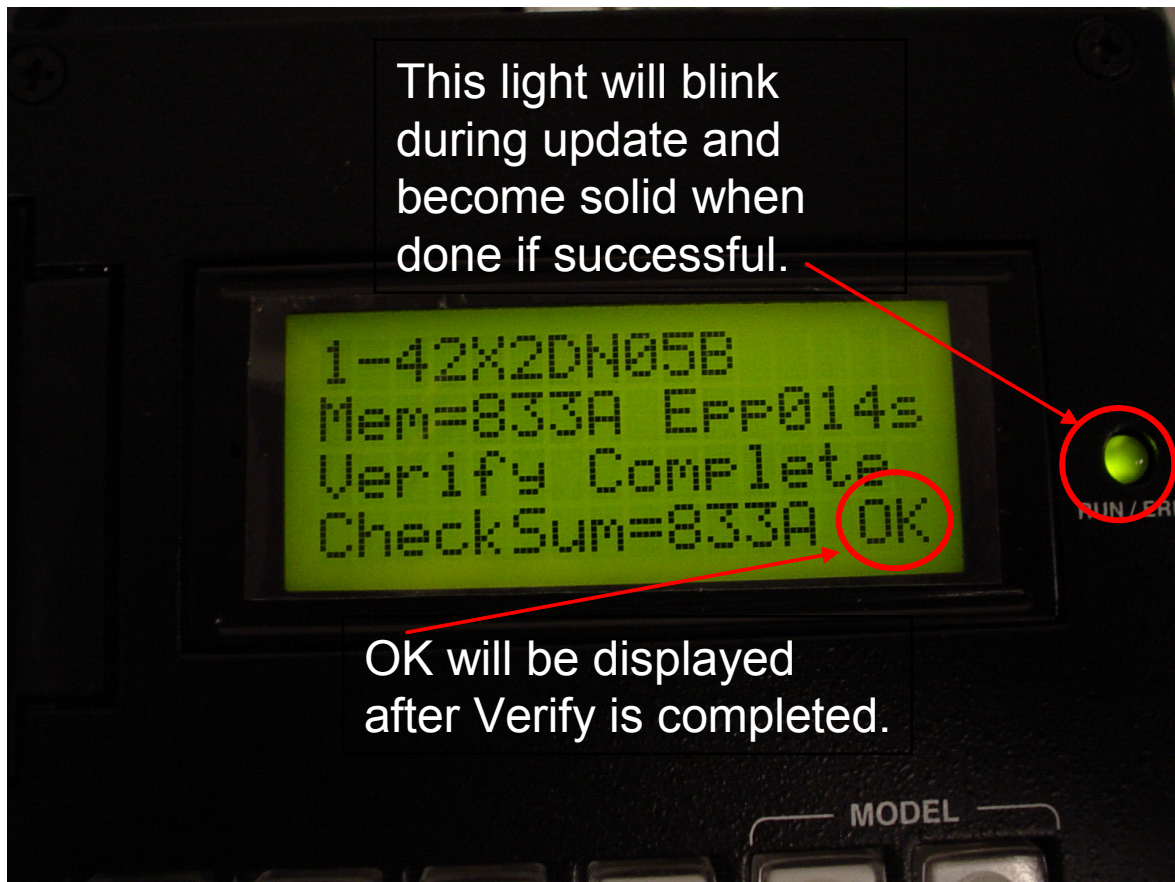
```
1-42X2DN05B
Mem=833A EPP005s
Verifying..
```

The display will then display (VERIFYING) and the LED will be blinking.

```
1-42X2DN05B
Mem=833A EPP014s
Verify Complete
Checksum=833A OK
```

If the update was successful the display will indicate (OK) and the LED will be on.

If the update is successful the display will appear as below:



- Switch the TV OFF and remove AC power.
- Switch the jig OFF and remove AC power.
- Remove the cable from the jig to the control PCB from P101 on the PCB.
- Reconnect P151 Y-SUS, P151 Z-SUS, P100 and P204 on the tuner PCB make sure AC cables are firmly connected to the AC switch and SMPS connectors are seated and all cables are in their retainers.
- Remount Digital/Tuner PCB mount assembly to the TV.

CABLECARD S-CARD

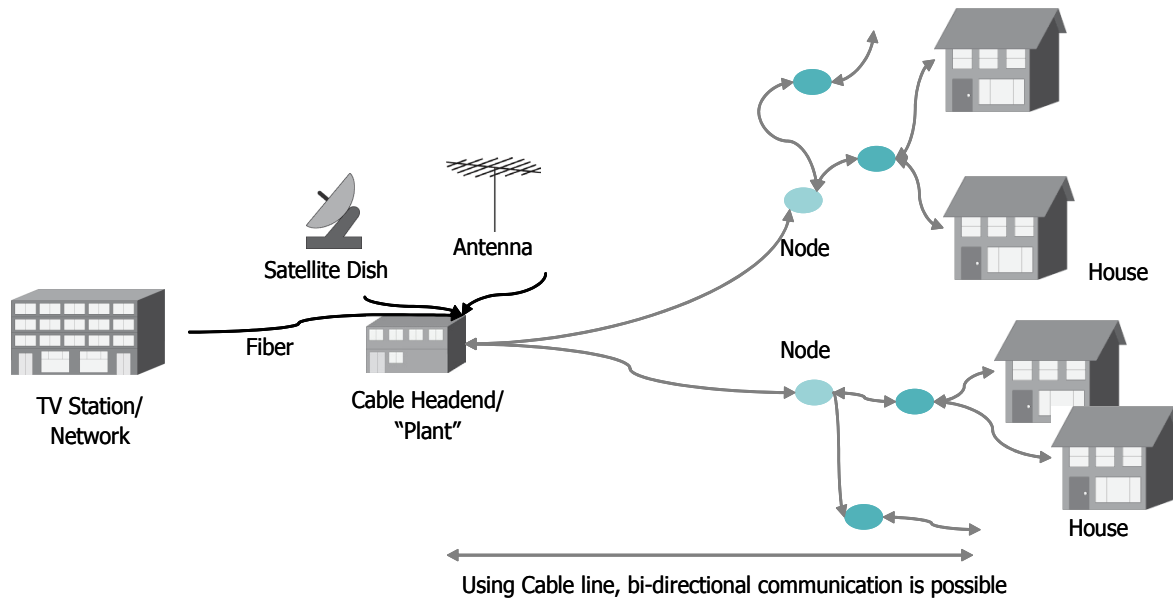
CABLECARD

DIGITAL CABLE READY (DCR)

A “plug-and-play” DTV is a television that you can plug directly into your cable system and receive analog and most digital cable services without the need for a set-top box. The cable and consumer electronics industries have dubbed these types of televisions “digital cable ready” or “DCR.”

Digital plug-and-play will not work quite like analog. For digital plug-and-play, you’ll probably need to get a security card (also known as a CableCARD™) from your local cable operator. The security card will permit you to watch scrambled programming and premium services, to which you’re subscribed.

A CableCARD device is A PCMCIA card distributed by cable operators and inserted into a DCR TV(Host) to enable premium services, also called “Card” and “Point of Deployment(POD) module”. It provides authorization, CA (Conditional Access) decryption and CP (Copy Protection) encryption functions for the consumer’s DCR TV.



CEA-NCTA AGREEMENT

- Signed Dec 19, 2002
- An agreement between cable operators and the consumer electronics industry
- How to offer digital programming over cable lines to current and future digital televisions without the need for a set-top box
- “Unidirectional” cable-ready digital television sets (called UDCP or UDRD)
 - * Conditional access mechanism
 - * Separate CableCARD (POD) card
 - * Only receive information from the headend (one-way)
- Cable industry: Comcast, Cox, Time Warner, etc. (8 companies)
- CE industry: Philips, Panasonic, Zenith, Samsung, Sony, etc (14 companies)
- First Verification started Feb 2004 (VW18) based on PICS/ATP

- DCR TV can receive:
 - * Off-air HD/HD through cable
 - * Off-air/Cable Analog & Digital
- But, DCR TV doesn't support:
 - * VOD, Impulse PPV
 - * EPG service provided by MSO

TERMS

CEA: Consumer Electronics Association

NCTA: National Cable & Telecommunications Association

POD: Point-Of-Deployment

UDCP: Uni-Directional Cable Product, UDRD : Uni-Directional Receiving Device

DCR: Digital Cable Ready

PICS: Protocol Implementation Conformance Statements

ATP: Acceptance Test Plan

PPV: Pay Per View

Off-air: Terrestrial retransmission through cable

Inband tuner: FAT tuner

OOB tuner: FDC tuner

CA: Conditional Access

CP: Copy Protection

OOB: Out Of Band

RDC: Reverse Data Channel

OOB: Out of Band

FDC: Forward Data Channel

FAT: Forward Application Transport

PSI: Program Service Information

SI: Service Information

Clear channel: Any channel that is not scrambled or encrypted. Thus the customer will be able to receive these channels with only basic cable service.

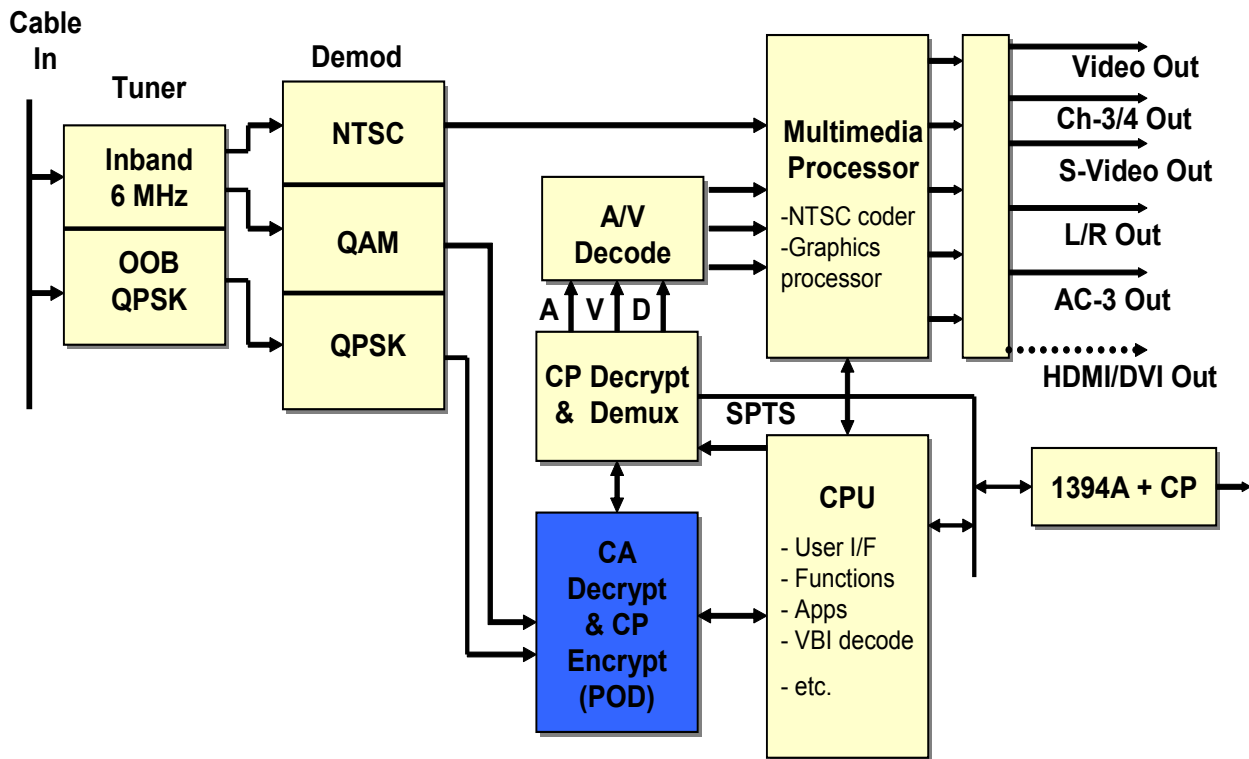
Scrambled/Encrypted Channels: Channels that are scrambled or encrypted and require additional equipment to receive these channels. EX: Cablecard or cable box.

VENDORS

- CableCARD (POD) vendors:
 - Motorola, Scientific Atlanta, SCM/NDS
- Cable HeadEnd vendors:
 - Motorola, Scientific Atlanta, Harmonic
- Cable MSO (Multiple System Operators)
 - Comcast, Time Warner, Charter, Cox, Adelphia, Bright House, Mediacom, Insight, CSC Holdings, Cable One, Advance/Newhouse, etc.

CABLECARD S-CARD

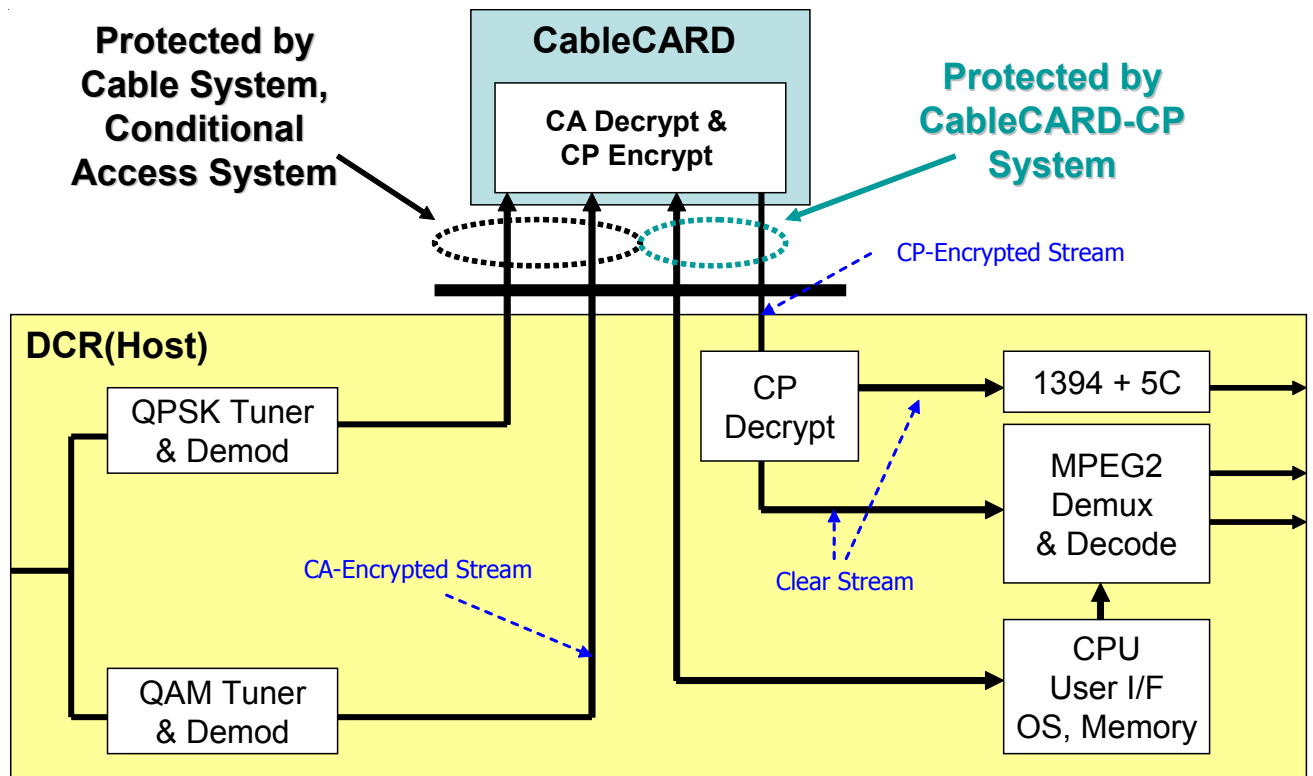
DCR ARCHITECTURE



The OOB (Out Of Band) tuner runs all the time, locked to the frequency which it is given by the Cablecard. The data from the Headend should be on this frequency. If it is not, the tuner will not see the data nor will the Cablecard. EX: If the cablecard tells the unit to tune to 104.20Mhz. The unit will tune to 104.20Mhz and not search for other frequencies. If the MSO (Multi System Operator) has the cards programmed to give the unit a list of frequencies, the unit will search that list of frequencies to find the data and then lock. If the data is on 104.25Mhz, neither the unit nor card can get the data needed to receive a channel list and an authorization list, the CP and decrypt data. As a result, the unit will not be allowed to tune premium channels.

HOST-CABLECARD INTERFACE

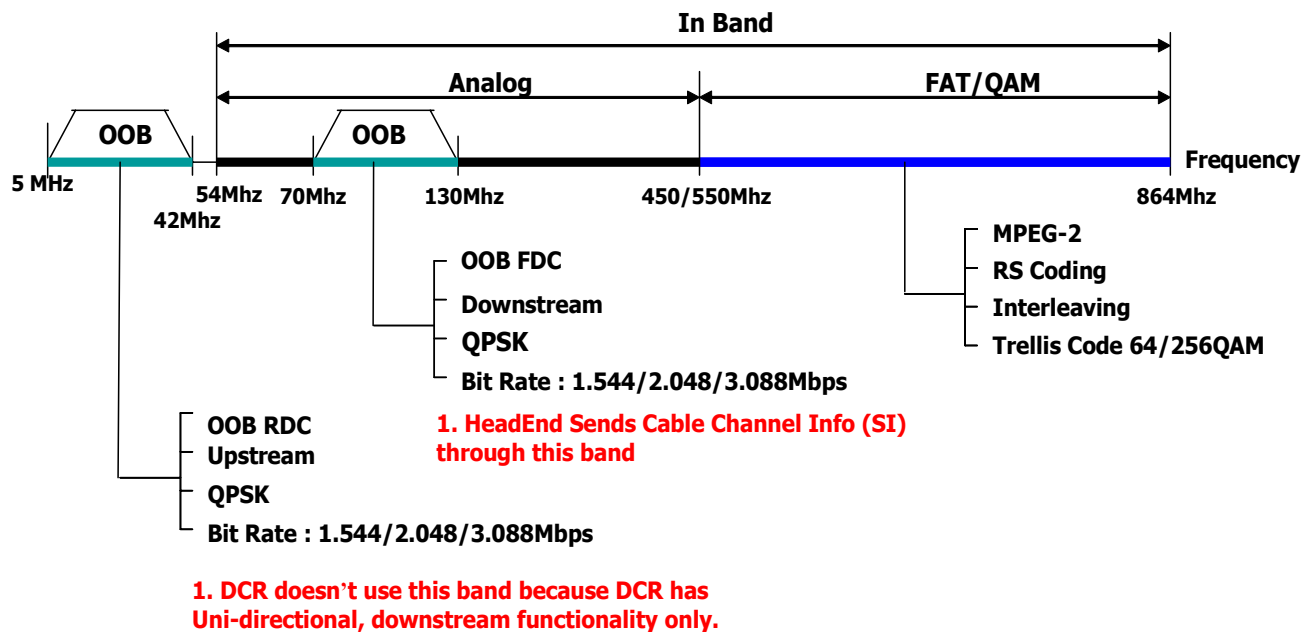
The data communication to and from the Cablecard and unit is encrypted. The Host (Unit) and POD (Cablecard) share a buffer so that the data from the headend is never lost. Some of the buffer is in the POD and some is in the host. The authorization list, CP data, Decrypt data and some other data is updated every 10 -20 seconds. This allows the cable company to add, remove, and rearrange channels as needed and the Cablecard is updated within seconds without the customer having to run EZ Scan to load new channels added to their lineup. The data from the headend is at regular intervals and can fluctuate in timing. This causes the data to flow at a higher rate at times and a lower rate at other times depending on other tasks the headend is performing on the system. The communication between the POD and host is a two way relationship. While the communication between the Cablecard and headend is only one way, from the headend to the card.



Most but not all, CADTV (Cable Digital Television) channels are scrambled and or encrypted. Therefore decryption is a part of a premium package the customer pays for. There are a few channels the cable company has to provide as open channels. This allows the customer who purchases an HD ready TV that is capable of processing QAM to receive a few HD channels thru the cable system. In LG units there are two ways the channels are displayed, as 2 part channels (EX: 107-1) and as single part channels EX: 107. With the Cablecard inserted the CADTV map will show only single part channels. Without the card installed the CADTV map will show two part channels. Due to this it will be in the ASC's best interest to have a constantly updated channel lineup showing which are scrambled and which are open channels for all the headends in the area you service product. A good relationship with the local cable company is crucial to this so you are kept up to date with fast changing channel lineups. This can prevent you from trying to repair a product that is not defective. EX: The customer complains they no longer receive CH 186 which was Discovery HD a scrambled channel. The real cause is the headend moved that channel to CH 205 and CH 186 is no longer in the channel map. All this occurs through the OOB channel.

CABLECARD S-CARD

IN-BAND/OOB SPECIFICATION



CABLECARD AUTHORIZATION & VALIDATION PROCESSES

- In order to activate CA service (called low-value service) and to receive Cable channel map, "Authorization process" is needed.
 - * Serial number and CableCARD ID are needed.
 - * During this process, CableCARD reset may occur.
 - * After this process is finished successfully, user can navigate cable channel map & can watch CA Encrypted services to which the user subscribes.
- In order to activate additional CP services (called high-value service), a "Validation process" is needed.
 - * Host/CableCARD ID is needed.
 - * HeadEnd sends Validation message through OOB channel.
 - * After Validation message is received by the CableCARD, the user can watch CP Encrypted services also.

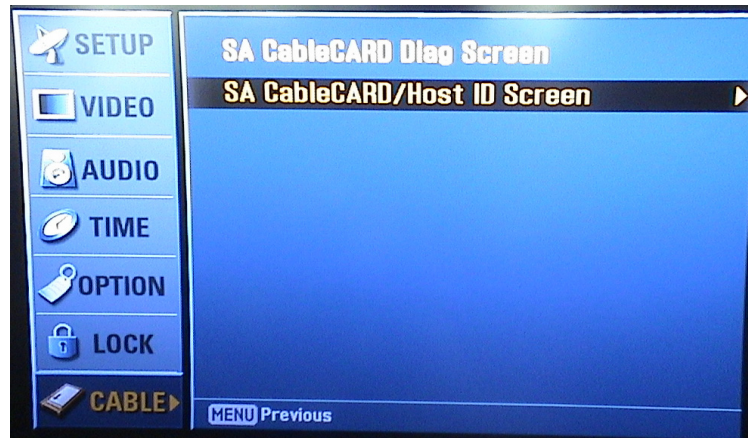
DCR FUNCTIONALITIES

- Conditional Access Function
- Copy Protection Function
- Cable menu & MMI (Man Machine Interface) Function
- Digital Certificates
- CableCARD reset Function
- EAS (Emergency Alert System) Function
- Host Diagnostics Function
- CableCARD Firmware Upgrade Function
- Error Reporting Function

CABLE MENU & MMI

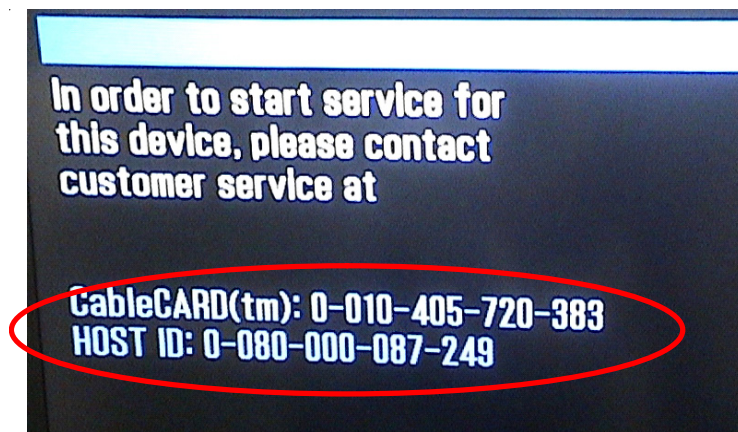
MMI = Man Machine Interface.

SA CABLECARD



Using Cable Menu, user can check status of various CableCARD functions. The lists of this menu vary depending on the CableCARD manufacturer.

MMI Example: SA CableCARD case



CableCARD uses MMI (Man Machine Interface) function to communicate with the user.

- CableCARD displays various user notification information through MMI window
- Host/CableCARD ID information

CABLECARD S-CARD

- the error reporting of Host's certification data.

MOTOROLA CABLECARD

The image shows two screenshots from a Motorola CableCARD interface. The left screenshot displays the 'Network Setup' screen with the following information: LKC: 104.200, EMM: 1, Status: TUNED_STATE, and OOB Msgs: 120637. A blue arrow points from this screen to a text box on the right. The right screenshot shows a 'SUCCESS!' message: 'Network Provider found. Frequency: 104.200, EMM: 1'. A blue arrow points from this screen to a text box below it. A third screenshot on the left shows the 'Motorola CableCard Menu' with options: SETUP, VIDEO, AUDIO, TIME, OPTION, LOCK, and CABLE. The 'Network Setup' option is highlighted.

Network Setup

LKC: 104.200 EMM: 1
Status: TUNED_STATE
OOB Msgs: 120637

CableCARD(tm) Message

SUCCESS!
Network Provider found.
Frequency: 104.200, EMM: 1

Motorola CableCard Menu

- FDC(OOB) tune frequency & EMM provider ID
- OOB rx tune status
- # of received OOB msg: It increases once tuned on

- Result after trying Hunt : After manual OOB tuning, it is showing that tuning was successful, that tune frequency is 104.200, and that EMM provider ID is 1.

The image shows a screenshot of the 'CableCARD(tm) Status' screen. It displays the following information: Manufacturer: 0x00 (Motorola), Version: 04.05, Unit Address: 0011D07340, 000-02988-73664-044, Download Status: Segments left to download: 0, State: Wait To Start, Entitlement Management Messages: EMM Provider ID: 1, and Out of Band Channel: Last Known Carrier: 104.200 Tuned. A blue arrow points from the 'Download Status' section to a text box on the left. Another blue arrow points from the 'Entitlement Management Messages' section to a text box on the left. A third blue arrow points from the 'Out of Band Channel' section to a text box on the left. A fourth blue arrow points from the 'Manufacturer' section to a text box on the left. A fifth blue arrow points from the 'Version' section to a text box on the left. A sixth blue arrow points from the 'Unit Address' section to a text box on the left. A seventh blue arrow points from the 'State' section to a text box on the left. An inset image shows the 'Motorola CableCard Menu' with the 'CableCARD(tm) Status' option highlighted.

CableCARD(tm) Message

CableCARD(tm) Status

Manufacturer: 0x00 (Motorola)
Version: 04.05
Unit Address: 0011D07340
000-02988-73664-044

Download Status
Segments left to download: 0
State: Wait To Start

Entitlement Management Messages
EMM Provider ID: 1

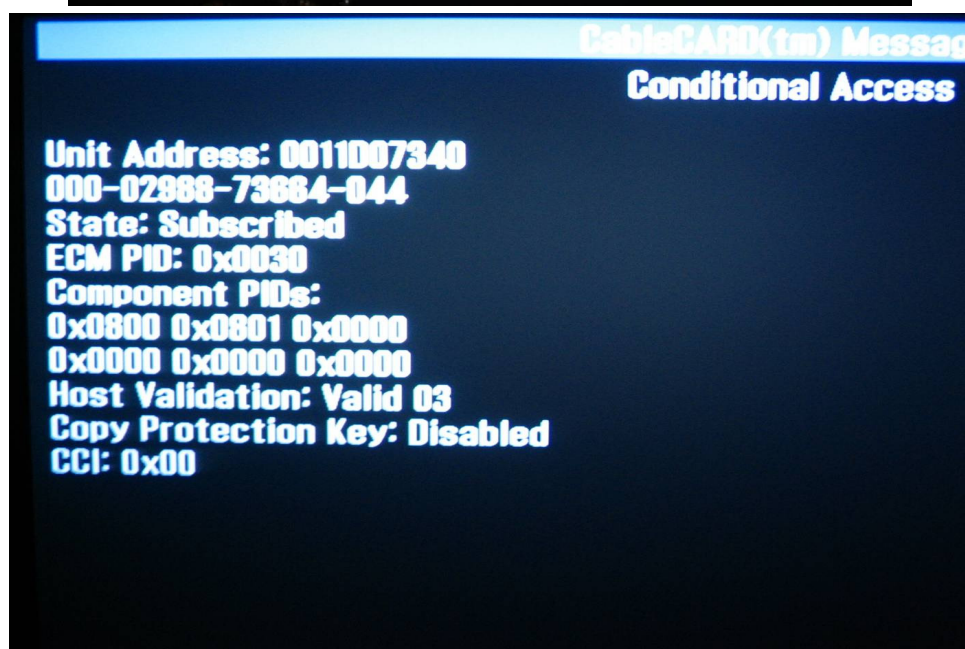
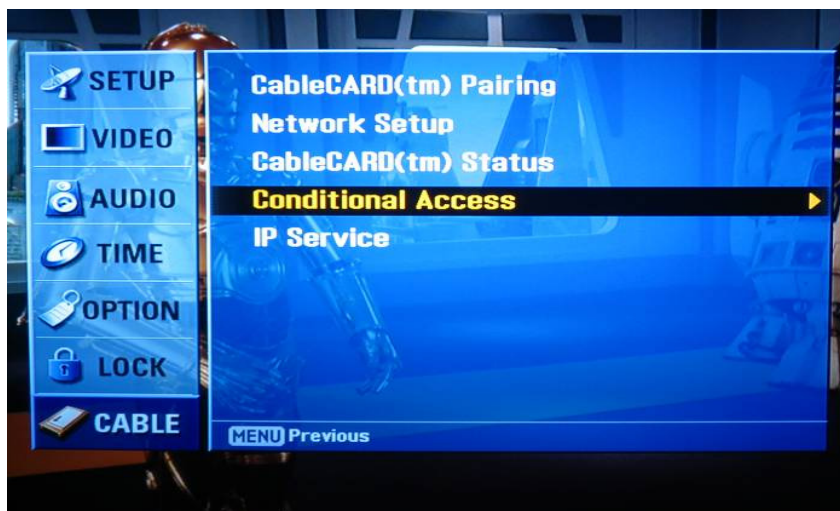
Out of Band Channel
Last Known Carrier: 104.200 Tuned

- CableCARD Manufacturer ID : Motorola is set by 0x00
- CableCARD firmware version
- CableCARD unit address : looks like CableCard's serial number, but not sure.

- Motorola CableCARD Code download
- Once initiated, segments left to download value increases.
- State indicates what the current state of download status is.

- EMM Provider ID

- OOB rx tuning frequency carrier status



- CableCARD unit address: This is the unit address the cable company will use to address data to this specific unit.
- State: CA Authorization. If subscriber already in subscription for the channel, it shows Subscribed. That is, it could be changed for each channel tuned.
- ECM PID from current channel.
- Component PIDs: video PID and audio PID of the channel tuned.
- Host Validation: CP validation status. The number shows validation trial counting, which is not related with channel.
- CP key: If CCI is non-zero, it becomes "enabled." which means CP scrambler is functioning.
- CCI: CCI information from current channel. If CCI is zero, CP is not functioning.

The line item is channel specific. It is indicating that the channel presently tuned by the hosts tuner is a subscribed channel. This indicates that the Cablecard has received and authorization channel list. A copy Protection Key is presently disabled for this channel. This can change according to the actions taken by the headend.

CABLECARD S-CARD

DIGITAL CERTIFICATES DATA

- Every TV and CableCARD has Digital Certificates Data to identify itself.
- * Host/CableCARD ID is determined from the value of individual Digital Certificates Data.

CableCARD side invalid Certificate

“Please call your cable operator and report an invalid CableCARD” error message will be displayed.

- DTV side Invalid or Without Certificate

“There was a technical problem during the authorization process. This production may have some component failure or may not be designed to be fully compatible with digital cable television service. Please contact the manufacturer or the retailer.” MMI message will be displayed.

CableCARD Reset

- Whenever the DCR TV or CableCARD think the other device is in an abnormal state, a CableCARD reset will recover the Host/CableCARD interface.

* 161-xx technical problem case.

- There are normal states when the Host/CableCARD interface needs to reboot by way of a CableCARD reset.

* CableCARD firmware upgrade case.

* HeadEnd Authorization case.

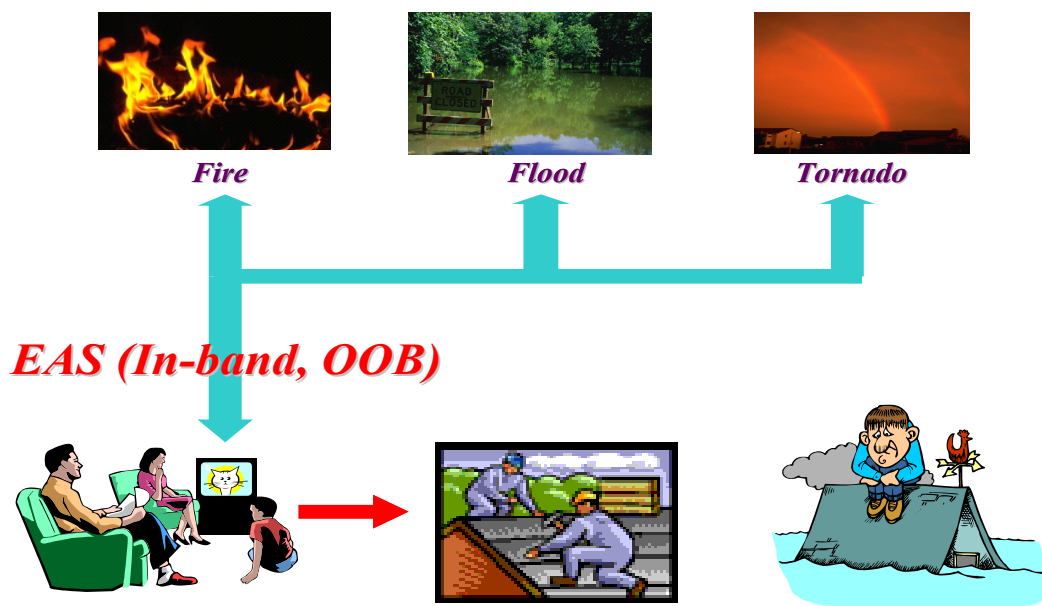
- There are two types of CableCARD reset

* PCMCIA reset (Cold reset, H/W level reset)

* POD reset (Warm reset, S/W level reset)

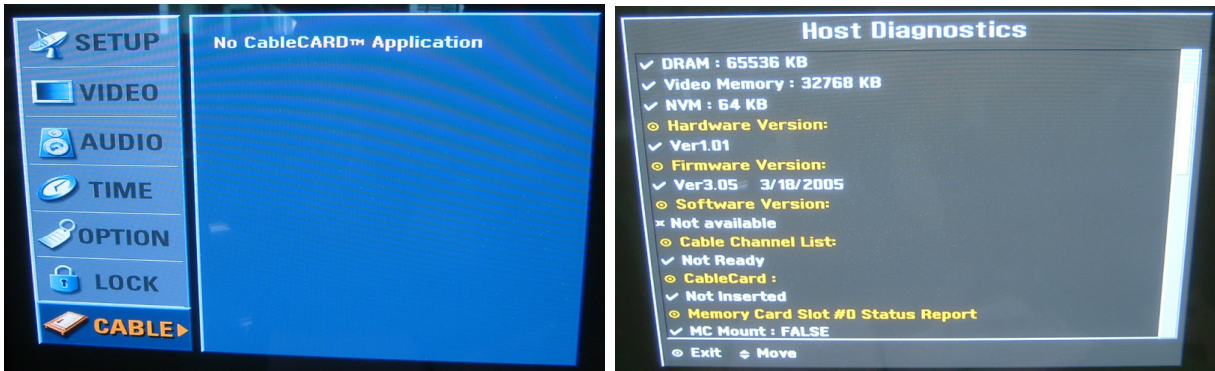
- When the CableCARD reset occurs, and if the user is watching CA or CP Encrypted service at that time, video will freeze for about 20 seconds.

EAS (EMERGENCY ALERT SYSTEM)



HOST DIAGNOSTICS

- To check the state of various TV functions related to the CableCARD, uses Host Diagnostic menu.
 - press Menu->CABLE->"0"->"0"->"0" to get into Host Diagnostics menu.
 - Cable Channel List's status
 - FAT, FDC status
 - H/W & F/W version



CableCARD Firmware Upgrade From the Headend to the Cablecard.

- When the CableCARD Firmware Upgrade is needed, HeadEnd activates CableCARD Firmware Upgrade operation.
 - * Delayed Upgrade mode (only at the stand-by state)
 - * Immediate Upgrade mode (stand-by or power-on state)
- CableCARD Firmware Upgrade shouldn't be interrupted by other operations.
 - * During this operation, a CableCARD Firmware Upgrade reporting message is being displayed and all remote control keys will be disabled temporarily.
 - * Only SA uses CableCARD Firmware Upgrade protocol and SA uses in-band tuner for this operation.
 - * Motorola uses their unique technique for the CableCARD firmware Upgrade and uses OOB tuner for this operation.

ERROR REPORTING

- Per the standard (SCTE28 Appendix E), in the case of pre-defined errors, the DCR should display an error message showing the 161-xx technical problem and/or set CableCARD reset to recover from this error.
 - * Failure mechanism is not the DCR but the CableCARD.
 - * "xx" digits are the index of this error.

A technical problem is preventing you from receiving all cable services at this time.

Please call your cable operator and report error code 161-xx to have this problem resolved.

CABLE CARD TROUBLESHOOTING

No	Error Condition	Failure Mechanism	No	Error Condition	Failure Mechanism
1	CableCARD READY signal does not go active.	CableCARD	13	LGE DTV response to open resource manager session response – resource manager unavailable	LGE DTV
2	LGE DTV reads incorrect CIS values	CableCARD	14	LGE DTV response to open resource manager session response – incorrect version of resource manager	LGE DTV
3	LGE DTV writes incorrect TPC11 E_INDEX value to POD configuration register	LGE DTV	15	LGE DTV response to open resource manager session response – resource manager busy	LGE DTV
4	LGE DTV sets data channel RS bit but CableCARD fails to set FR bit within 5 second timeout.	CableCARD	16	LGE DTV response to open resource manager session response – invalid status byte	LGE DTV
5	Host sets extended channel RS bit but CableCARD fails to set FR bit within 5 second timeout.	CableCARD	17	CableCARD fails to respond to profile_inq within 5 seconds.	CableCARD
6	Invalid buffer negotiation - CableCARD data channel (buffer size < 16)	CableCARD	18	LGE DTV resource response – no application information resource	LGE DTV
7	Invalid buffer negotiation – LGE DTV data channel (buffer size < 16 or greater than CableCARD data channel buffer size)	LGE DTV	19	LGE DTV resource response - no LGE DTV control resource	LGE DTV
8	Invalid buffer negotiation – CableCARD extended channel (buffer size < 16)	CableCARD	20	LGE DTV resource response - no system time resource	LGE DTV
9	Invalid buffer negotiation – LGE DTV extended channel (buffer size < 16 or greater than CableCARD data channel buffer size)	LGE DTV	21	LGE DTV resource response - no MMI resource	LGE DTV
10	CableCARD does not respond to Hosts open transport request within 5 seconds.	CableCARD	22	LGE DTV resource response - no low speed communications	LGE DTV
11	LGE DTV does not respond to CableCARD request to open resource manager session within 5 seconds.	LGE DTV	23	LGE DTV resource response - no homing resource	LGE DTV
12	LGE DTV response to open resource manager session response – resource manager non-existent	LGE DTV	24	LGE DTV resource response - no copy protection resource	LGE DTV

No	Error Condition	Failure Mechanism	No	Error Condition	Failure Mechanism
25	LGE DTV resource response - unknown resource identifier.	LGE DTV	37	CableCARD response to conditional access resource session - invalid status byte	LGE DTV
26	LGE DTV fails to respond to open session request within 5 seconds.	LGE DTV	38	CableCARD fails to respond to ca_info_inq within 5 seconds.	CableCARD
27	LGE DTV response to open application info resource session - application info non-existent	LGE DTV	39	CableCARD module requests to open copy protection resource session to the LGE DTV times out after 5 seconds.	LGE DTV
28	LGE DTV response to open application info resource session - application info unavailable	LGE DTV	40	LGE DTV response to open copy protection resource session - copy protection non-existent	LGE DTV
29	LGE DTV response to open application info resource session - incorrect version of application info	LGE DTV	41	LGE DTV response to open copy protection resource session - copy protection unavailable	LGE DTV
30	LGE DTV response to open application info resource session - application info busy	LGE DTV	42	LGE DTV response to open copy protection resource session - copy protection busy	LGE DTV
31	LGE DTV response to open application info resource session - invalid status byte	LGE DTV	43	LGE DTV response to open copy protection resource session - invalid status byte	LGE DTV
32	CableCARD module requests to open conditional access session to the Host times out after 5 seconds.	LGE DTV	44	LGE DTV does not support POD's copy protection system.	LGE DTV/CableCARD incompatibility
33	CableCARD response to conditional access resource session - conditional access non-existent	LGE DTV	45	LGE DTV and CableCARD do not mate	LGE DTV/CableCARD incompatibility
34	CableCARD response to conditional access resource session - conditional access unavailable	LGE DTV	46	LGE DTV response to CP_sync - LGE DTV busy	LGE DTV
35	CableCARD response to conditional access resource session - incorrect version of conditional access	LGE DTV	47	LGE DTV response to CP_sync - no CP support	LGE DTV
36	CableCARD response to conditional access resource session - conditional access busy	LGE DTV	48	LGE DTV response to CP_sync - invalid status	LGE DTV
			49	LGE DTV fails to respond to cp_open_req.	LGE DTV
			50	Invalid LGE DTV certificate	LGE DTV

No	Error Condition	Failure Mechanism
51	Write Error (WE) occurs after completion of any transfer from LGE DTV to Cable CARD	CableCARD or LGE DTV
52	Read Error (RE) occurs after completion of any transfer from Cable CARD to LGE DTV	CableCARD or LGE DTV
53	CableCARD fails to respond to any request within 5 seconds.	CableCARD
54	Invalid session APDU from LGE DTV	LGE DTV
55	Invalid session APDU from Cable CARD	CableCARD
56	Invalid SPDU tag from LGE DTV	LGE DTV
57	Invalid SPDU tag from CableCARD	CableCARD
58	Invalid APDU tag from LGE DTV	LGE DTV
59	Invalid APDU tag from Cable CARD	CableCARD
60	Transport ID from Host that has not been created and confirmed by POD	LGE DTV
61	Transport ID from Cable CARD that has not been created by LGE DTV.	CableCARD
62	Session ID from LGE DTV that has not been created and confirmed by Cable CARD	LGE DTV
63	Session ID from CableCARD that has not been created by LGE DTV.	CableCARD

The following chart will help as a guide to troubleshoot Cablecard related problems.

Operation	Good Result	Else Problem
Plug in CableCARD™		
	Screen displays CableCARD Inserted	1) Re-insert card 2) Try another card >Defective card slot
Check Pairing Menu > Cable > CableCard Pairing		
	CableCard™: must not be all zeros	If all zeros, card defective
	Host ID: must not be all zeros	If all zeros, card defective
Check Channel List Ready Menu > "000"		
	Cable Channel List: Ready	Wait for download >No OOB data – goto diagnostic screen
Goto Diagnostic Screen Menu > "000"		
	OOB S/N > 10 dB	Bad signal
	OOB frequency = Between 70 and 130 MHz	

	FAT Status : SNR > 21 dB (64 QAM) SNR > 28 dB (256QAM) Carrier: Locked	Channel not receivable
Check OOB Function Menu > Cable > Network Setup		
	LKC shows frequency	
	Status: tuned state	
	OOB Msg: # should increase each time this screen is accessed	No OOB data signal
Check OOB Function Menu > "000"		
	FDC Status: FDC_SNR > 10 dB	Weak, distorted signal
	FDC Center Freq: 75.25 MHz or between 70 and 130 MHz	
	FDC Carrier: Locked	

CABLECARD S-CARD

Cable Operation Confirmation

- (1) Confirm that the Cable Card is inserted in the slot.
- (2) Enter the EZ adjust menu by pressing the Adjust key on the Service Remote Control (S R/C).
- (3) Go to number 2 Cable Check and press the Right key (%).
- (4) Confirm items below.

NAME	NORMAL	DEFECTIVE
Descrambler Check	OK	Not OK
CableCARD	CableCARD is removed	CableCARD is inserted
OOB Path	Locked - OK	Unlocked - Not OK
FDC_SNR	20bd or more - OK	Under 20db - Not OK
Video Signal	Normal Screen	Black Screen

CableCheck

- | | |
|---------------------|-----------------------|
| 1 Descrambler Check | OK |
| 2 CableCARD | CableCARD is inserted |
| 3 OOB Path | OK (Lock) |
| 4 FDC_SNR | OK (23 db) |

IN-HOME TROUBLESHOOTING

1. It is recommended that installers bring along a couple of CableCARDS for troubleshooting. This will help eliminate the CableCARD as a possible problem during the installation.
2. Before installing the CableCARD, installers should check that the Digital Cable Ready (DCR), also referred to as a HOST, is functional without a CableCARD.
 - a. Verify Host (TV) Operation: The installer can perform this by connecting the RF cable to the correct cable input of the DCR (there may be connections for a terrestrial antenna) and verifying good picture quality. The DCR will display all non~encrypted analog and digital content. (The DCR must not receive RF signal via an STB or accessory RF modulator.) This will eliminate basic TV circuitry as a possible problem.
 - b. Check that the CableCARD is inserted properly. When inserting cable card push carefully but firmly until you feel the card click into place.
 - c. Verify RF from Cable System Tap: The installer can also connect a cable set top box to confirm reception of encrypted digital services. This will help eliminate the RF signal as a possible problem,
3. If the first CableCARD installed does not result in a User Interface screen (also referred to as MMI screen) within 5 ~ 7 minutes, try unplugging the AC Power cord of the DCR and reconnecting it (to reset the DCR) then try to await coming out of the User Interface screen again. If this is still unsuccessful, try another CableCARD.
 - a. To eliminate the possibility of a damaged CableCARD or DCR device, the technician should look closely at the CableCARD device to ensure that none of the pinholes are blocked or clogged.
 - b. Check Host Interface. Using a flashlight, the technician should check the CableCARD slot on the DCR TV to ensure that there are no bent pins.
4. If the second CableCARD is successful, make sure the CSR or Dispatcher knows the new MAC ID and CableCARD ID to complete the installation. The original card should be marked accordingly and returned for repair.
5. Check the CableCARD menu options. If the second CableCARD fails to bring up the User Interface screen, the technician should refer to the diagnostic menus on the DCR for further troubleshooting. The technician can pull up the User Interface screen manually through the menu choices. The customer should provide the User Manual, so the technician can easily navigate through the DCR TV menu screens. The table on the next page describes how to navigate the CableCARD menu. The list of selectable CableCARD options will vary, depending on your cable service provider or CableCARD manufacturer. The table also shows how to access diagnostic screens for the DCR TV. Many of these screens are not described in the User Manual.
6. If the second CableCARD is successful, make sure the CSR or Dispatcher knows the new MAC ID and CableCARD ID to complete the installation. The original card should be marked accordingly and returned for repair.

CABLECARD S-CARD

- Check the CableCARD menu options. If the second CableCARD fails to bring up the User Interface screen, the technician should refer to the diagnostic menus on the DCR for further troubleshooting. The technician can pull up the User Interface screen manually through the menu choices. The customer should provide the User Manual, so the technician can easily navigate through the DCR TV menu screens. The table below describes how to navigate the CableCARD menu. the list of selectable CableCARD options will vary, depending on your cable service provider or CableCARD manufacturer. The table below shows how to access diagnostic screens for the DCR TV. Many of these screens are not described in the User Manual.

CableCARD Mfg	Diagnostic Type	1st key	2nd key	3rd key
ALL	CableCARD main menu	MENU	Use cursor to select CABLE icon then press ENTER	N/A
Motorola	CableCARD pairing status	MENU	Use cursor to select CABLE icon then press ENTER	Use cursor to select CableCARD Pairing option, press ENTER
Motorola	Network status	MENU	Use cursor to select CABLE icon then press ENTER	Use cursor to select Network Setup option, press ENTER
Motorola	CableCARD status	MENU	Use cursor to select CABLE icon then press ENTER	Use cursor to select CableCARD Status option, press ENTER
Motorola	CA status	MENU	Use cursor to select CABLE icon then press ENTER	Use cursor to select Conditional Access option, press ENTER
NDS	CableCARD pairing status	MENU	Use cursor to select CABLE icon then press ENTER	Use cursor to select CableCARD Pairing option, press ENTER
NDS	Network status	MENU	Use cursor to select CABLE icon then press ENTER	Use cursor to select Network Setup option, press ENTER
NDS	CA status	MENU	Use cursor to select CABLE icon then press ENTER	Use cursor to select Conditional Access option, press ENTER
SA	CableCARD Diagnostics	MENU	Use cursor to select CABLE icon then press ENTER	Use cursor to select SA CableCARD Diag option, press ENTER
SA	CableCARD pairing status	MENU	Use cursor to select CABLE icon then press ENTER	Use cursor to select SA CableCARD HOST ID option, press ENTER
SA	CableCARD Copy protection information	MENU	Use cursor to select CABLE icon then press ENTER	Use cursor to select SA CableCARD CP Screen option, press ENTER

- If the installer is still having a problem, the installer should report the problem to the MSO headend dispatcher for troubleshooting. If the cable company dispatcher (headend personnel) has completely checked their channel set-up, confirmed the accounting/billing system to setup is correct, and has confirmed normal channel map with one or more other DCR TVs at the MSO headend, then go on to the next step,
- If the installer determines that the DCR device is the problem (unit failed either item 2a or 3b above) and can go no further in correcting the problem, and if the installer determines that the host-pod pairing screen cannot be displayed with multiple CableCARDs, he or she should follow the directions given by the CE manufacturer in informing the customer of their options, The customer should start by contacting the CE manufacturer directly for assistance and/or repair information. In many cases, if the HOST is under warranty, the repair will be done at the customer's home when possible.

9. If using an STB will allow the customer to receive services on the damaged DCR device, the installer can leave a box in the customer's home until the customer resolves the issue with the CE manufacturer.
10. If the technician is able to install the CableCARD device and access the User Interface screen (also referred to as MMI screen), and has relayed the information to the dispatcher, but is still not receiving encrypted programming, this programming may be protected through the use of copy protection directive. Ensure that the information passed to dispatch is correct. Relay again the Host ID, CableCARD ID and Data ID (Motorola only). Dispatch will send a hit to the CableCARD once the information is checked and verified. The CableCARD must be paired to the Host before copy protected programming can be displayed. Note that it may take several minutes from the time dispatch sends the authorization before it reaches the DCR device. The MMI screens should be checked to verify if the authorization has been received. For SA systems the host-pod pairing screen should say "Authorization Received." For Motorola the Conditional Access MMI State parameter should say "Subscribed". (These should be verified by POD Manufacturers or cable companies.)
11. To confirm the Headend Validation for displaying the encrypted channel, the technician should check the CableCARD menu. For SA systems, the CableCARD Copy Protection Information menu should say "Authorization Received". For Motorola systems, the Conditional Access menu should say "Valid xx (2 digit)".
12. If encrypted programming is still not displayed, installer should check the status of followings.
 - a. Cable Channel List: Ready
 - b. CableCard: Inserted
 - c. FDC status (OOB Status): Lock
 - d. SNR(Signal to Noise Ratio): higher than 12 dB is normal range,

The table below describes how to check status in the LG DCR TV.

CableCARD Mfg	Diagnostic Type	1st key	2nd key	3rd key	4th key	5th Key
ALL - works with any CableCARD	Host Diagnostics (In Band Signal Status, OOB Signal Status, etc)	MENU	Use cursor to select CABLE icon	Press button 0 (zero)	Press button 0 (zero)	Press button 0 (zero)

CABLECARD S-CARD

CABLECARD TROUBLESHOOTING

HOST DIAGNOSTICS

This Menu is only active on Cablecard ready units.

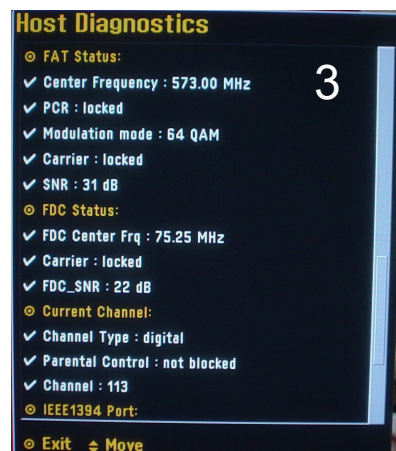
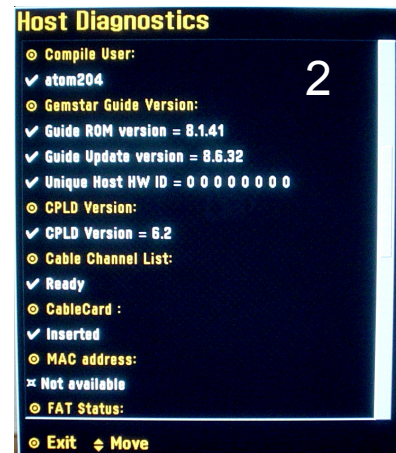
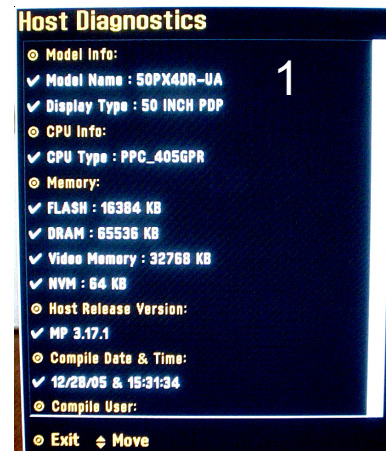
Accessing Host Diagnostics:

1. Press Menu on the customer's remote.
2. Press the up or down arrow key to highlight CABLE.
3. Press the 0 key three times. Scroll up and down this menu by using the up and down arrow keys.

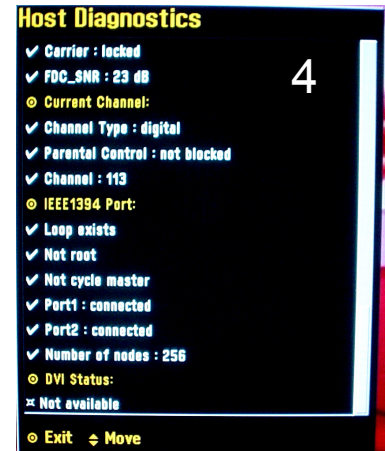
The model info gives the factory model information also used to access the debug menu for software updates. Memory shows the available memory in the unit for video and audio processing and Cablecard functions. Host release is the present software revision in the unit.

Gemstar Guide Version gives the original version of Gemstar in the unit when installed. Guide Update Version is the latest version of Gemstar loaded into the unit by Gemstar. Cable Channel List gives the status of the list of available channels in memory, with a Cablecard installed this should always display Ready. Cablecard indicates if the cablecard is inserted. If the Cablecard is inserted and the unit does not indicate that it is. There could be an issue with the Cablecard itself or with the programming in the card. Once this has been eliminated as the cause. The card slot or Digital PCB could be the cause.

FAT Status tells the frequency of the presently tuned channel as well as the modulation QAM 256/64, digital, analog. Carrier locked indicates the carrier is locked on the center frequency. SNR gives the (Signal to Noise Ratio) of the present signal tuned. FDC is your (Forward Data Carrier) this gives the state of the OOB signal thru which the Cablecard receives data from the headend. It indicates the center frequency that the card told the unit to look at to find the signal. Carrier indicates the unit has the carrier locked or not locked. This must be locked for the Cablecard to operate. FDC_SNR gives the (Signal to Noise Ratio) for this OOB signal. Current Channel shows the channel type Digital or Analog as well as the Parental Control setting for this channel and the channel number.



This indicates the state of the IEE1394 and DVI ports and connection settings.



The meter below shows we are looking for 104.20Mhz. What we find is the signal is shifted slightly. This indicates the signal is not centered on 104.20Mhz. The OOB tuner is told to look for the data on 104.20Mhz but the data is actually on 104.25Mhz. This is enough shift to prevent the card from receiving the data it needs from the headend. This signal is not allowed this much variation.



M-CARD SCOPE

This specification defines the normative characteristics for the interface between a security module, owned and distributed by cable operators, and commercially available consumer receivers and set-top terminals; host devices that are used to access multi-channel television programming delivered on North American cable systems. Some examples of host devices are set-top boxes, televisions, and VCRs. In some cases, a local cable operator may choose to supply this host device in addition to the security module. In order to receive scrambled cable services, the Host would require this security module, called a CableCARD™ device, to be inserted and authorized to receive services. This CableCARD device, previously identified as a Point of Deployment (POD) module, provides the conditional access operation and the network connectivity for the Host.

This CableCARD device-Host Interface (CHI) specification defines the interface between the Host device (Host) and the CableCARD device (Card).

There are currently two modes of operation in which the Host and the Card can operate. The Single-Stream CableCARD device (S-CARD) is the first generation security module that can only operate in the Single-Stream Mode (S-Mode), and the Multi-Stream CableCARD device (M-CARD), is a second-generation variant that is capable of operation in either Multi-Stream Mode (M-Mode), or in Single-Stream Mode (S-Mode), based on the Host and its available functionality.

This document defines the interface for both the S-CARD and the M-CARD and the different operating modes. The M-CARD, when operating in S-Mode, is backward compatible with the Single-Stream CableCARD Host Interface as previously defined via ANSI/SCTE 28, the Host-POD Interface Standard, and ANSI/SCTE 41, the POD Copy Protection System. When the M-CARD is running in M-Mode, functionality to support multiple program decryption from multiple transport streams is added. One application for the M-CARD could be a Host device with multiple tuners and QAM demodulators.

While analog television channels may be tuned, only digital television channels will be passed through the Card for descrambling of authorized conditional access channels, and passed back to the Host. The Card will not only provide the conditional access decryption of the digital television channel, but MAY also provide the network interface between the Host and the cable system.

This document is a compilation of the specifications, standards, and related text from the OpenCable Specification CableCARD Interface documents, single stream and multi-stream, OC-SP-CC-IF and OC-SP-MC-IF, as well as the SCTE 28, 2004 documents. For the text that was extracted from the SCTE 28 2004 document, in all cases, the terms “POD” and “POD module” were replaced with the terms “Card” and “CableCARD device”.

M-CARD Introduction and Overview

This specification defines the characteristics and normative specifications for the interface between the Card device and the Host device. This specification describes the interface for both the Single Stream Card and the Multi-Stream Card.

- Single Stream Card (S-CARD) for use with or between Cards and Hosts capable only of processing a single program on the interface is said to be operating in Single Stream Mode (S-Mode).
- Multi-Stream Card (M-CARD) for use between a Card and Host both capable of processing multiple simultaneous programs on the interface is said to be operating in Multi-Stream Mode (M-Mode). The M-CARD, when instructed to do so by the Host, can operate in S-Mode. The M-CARD can only operate in either M-Mode or S-Mode, not both.

This specification supports a variety of conditional access scrambling systems. Entitlement management messages (EMMs) and Entitlement Control Messages (ECMs) across the interface for such scrambling systems are carried in the cable out-of-band channel as defined by [SCTE55-2], [SCTE55-1], and the DOCSIS® Set-top Gateway Specification [DSG].

The interface will support Emergency Alert messages transmitted over the out-of-band channel to the Card which will deliver the message to the Host using the format defined in [J042]. This specification defines, sometimes by reference, the physical interface, signal timing, link interface, and application interface for the Card-Host interface (CHI).

1.2 Historical Perspective (Informative)

Portions of this specification have origins in EIA-679, the National Renewable Security Standard, which was initially adopted in September 1998. Part B of that standard uses the same physical size, shape and connector of the computer industry PCMCIA card defined elsewhere, and defines the interface protocols and stack. Part B of that standard was adopted by SCTE DVS.

Further extensions and modifications of EIA-679 led to the adoption of EIA-679-B in 2000. The EIA-679 standard was developed substantially by the EIA/NCTA Joint Engineering Committee (JEC) National Renewable Security Standard (NRSS) Subcommittee, and was a joint work of NCTA and CEMA Technology & Standards.

The M-Mode specification has its origin in ANSI/SCTE 28, where the original version of the Card provided only enough bandwidth for a S-Mode. As DVRs, picture-in-picture, and other M-Mode features were developed, it was realized that the original S-Mode had inadequate bandwidth for some of these features, and could not grow to support multi-tuner gateway scenarios.

A M-Mode provides the higher transport data throughput rates that would be required to support future features, such as multiple-tuner Hosts, Hosts with DVRs, Hosts with picture-in-picture capability, and future extensions of existing conditional access functions to include Digital Rights Management.

This specification document is based on and conforms to much of the technical content as found in ANSI/SCTE 28, 2004.

CABLECARD M-CARD

M-Card / S-Card operation

Reporting CableCARD Device and Host Identification Information

The CableCARD device extracts the CARD_ID and Host_ID from the authenticated X.509 device certificates and sends them to the headend. Two means are employed to report these IDs. In order of preference:

- Two-Way: If the cable system has an active RDC (legacy or DSG) and the Host has an RDC transmitter, the CableCARD device MAY use them to report the IDs to the headend.
- Manual: If an automated means is not available, the CableCARD device will display the ID information on the subscriber's TV screen with a reporting telephone number and a request for the subscriber to call the operator to manually report the ID information.

Headend ID Validation

The cable operator records the reported IDs and their binding as a copy protection pair. If the devices are authorized to receive copy-protected content, the CA System will send a validation message to the CableCARD device with the validated IDs. After receiving and authenticating this message the CableCARD device checks that the received IDs are the same as its current binding and if so enables delivery of copy protected content to the bound Host.

Copy Control Information

Copy control information (CCI) is passed from CableCARD device to Host across the data channel to inform the Host device of the level of copy protection required. CCI is sent in the clear to the Host device,

Encryption of Copy Protected Content

All copy protected content will arrive at the Host device as a data stream encrypted by the service providers CA System. This CA-encrypted stream passes from the Host to the CableCARD device while still protected by the CA System. When fully bound to an authenticated and validated Host and authorized by the CA System the CableCARD device removes the CA-encryption.

The CableCARD device passes content in one of four modes determined by CA System scrambling mode and EMI values as detailed in Table 10.

- Clear: no change of CA-unscrambled and EMI=0 content which remains 'in-the-clear'
- CA-only: descrambles CA-scrambled content marked EMI=0 for output 'in-the-clear'
- Rescramble: CA-descrambles and CP-scrambles content marked EMI>0
- Pass-through: no change of CA-scrambled content (leaving it unrecognizable to the Host)

When selected, data packets of all selected and copy protected content from multiple simultaneous programs are protected in the same manner with the same CPKey.

CP-Scrambling as a Function of CA-Scrambling and EMI Value

The CableCARD device SHALL apply copy protection scrambling of content flowing to the Host as shown in Table 10.

CP-Scrambling Based on CA-Scrambled State and EMI Value

APS	Description
0	Copy Protection Encoding Off
1	AGC Process On, Split Burst Off
10	AGC Process On, 2 Line Split Burst On
11	AGC Process On, 4 Line Split Burst On

Verify Shared Authentication Key

The CableCARD device SHALL request and the Host SHALL provide AuthKey_H. The CableCARD device SHALL compare AuthKey_H to AuthKey_C. If they are identical the CableCARD device SHALL store AuthKey in non-volatile memory. This completes CableCARD-Host mutual authentication and the Card SHALL initiate CPKey generation and enable CA-decryption of MPEG programs with zero EMI.

If the binding is not validated, the CableCARD device SHALL initiate ID reporting or resume ID reporting attempts.

Invalid Certificate

In the event that the CableCARD device supplies an invalid certificate to the Host, the Host SHALL display a message informing the user, for example:

**CableCARD Device Certificate
Invalid**

In the event that the Host supplies an invalid certificate to the CableCARD device, the CableCARD device SHALL request the copy protection message screen and display a message informing the user, for example:

Host Certificate Invalid

Other Authentication Failures

If any other part of mutual authentication procedure described above fails, including signature or AuthKey verification, the CableCARD device SHALL take the following steps:

1. Notify the headend by automated means (RDC) if possible,
2. Open a session to the Host's MMI resource and MMI dialog (if not already open),
3. Display a message to the subscriber similar to that shown below in Figure 2.

Example CP System Failure Notification message

There was a technical problem during the authorization process. This product may have some component failure or may not be designed to be fully compatible with digital cable television services. Please contact the manufacturer or the retailer.

Following display at initial failure, the CP system failure notification message SHALL be displayed only if authentication has failed and 1) the message is selected through a user interface menu, or 2) the user tunes to a scrambled channel protected by the CA System.

COPY CONTROL INFORMATION (CCI)

The content provider and the content distributor determine the CCI value for each program. The CA System delivers the CCI for each program securely to the CableCARD device. The CableCARD device passes CCI to the Host through a secure authentication protocol, run once for each copy protected program being decrypted. The Host uses the CCI to control copy creation, analog output copy control encoding, and to set copy control parameters on Host outputs for a particular program. CCI is time sensitive. The Host SHALL retain the temporal association of CCI with program content to within 2 seconds. The Host SHALL control output of content according to the originally associated CCI value.

EMI - Digital Copy Control Bits

CABLECARD M-CARD

The two lsb of the CCI byte are the EMI bits. They SHALL control copy permissions for digital copies. The EMI bits SHALL be supplied to any Host digital output ports for control of copies made from those outputs. The EMI bits are defined in Table 5.

EMI Values and Content Type

EMI Value	Digital Copy Permission	Content Type
0	Copying not restricted	Not “High Value”
1	No further copying is permitted	High Value
10	One generation copy is permitted	High Value
11	Copying is prohibited	High Value

APS - Analog Protection System

Bits 3 and 2 of CCI as shown in Table 4 are the APS bits 1 and 0 respectively. The Host SHALL use the APS bits to control copy protection encoding of analog composite outputs as described in Table 6.

APS Value Definitions

APS	Description
0	Copy Protection Encoding Off
1	AGC Process On, Split Burst Off
10	AGC Process On, 2 Line Split Burst On
11	AGC Process On, 4 Line Split Burst On

MCARD Diagnostic Screens

Overview

Introduction

This chapter includes the diagnostic screens specific to the CableCARD module, including the fields and parameters that are included within these screens. These screens accumulate data that describe the current state of the CableCARD module, as well as copy protection, Digital Audio-Visual Council (DAVIC), and DSG-related information.

Accessing CableCARD Diagnostic Screens

Accessing CableCARD diagnostic screens is dependent upon the manufacturer of the host that is being used. Please refer to the documentation that came with your host device for details.

In This Chapter

This chapter contains the following topics.

Introduction

This section provides an overview of the SA CableCard CA Screen, including the fields and parameters that are included in the screen. This screen provides information about the CableCARD in reference to conditional access (CA).

Performing Tasks

By accessing this screen, you can perform the following tasks:

- Determine the current PowerKEY operating status for the CableCARD module.
- Determine the number of EMM messages received and validated by the

CableCARD module

- Determine if there has been a decryption failure, and if so, when it occurred

Example:

```
Scientific Atlanta CableCARD(tm)
CA Screen
-----
System Id: 0x0E00
Status: Ready
Internal Secure Micro Serial No-
00:14:F8:F1:0A:5D
External Secure Micro Serial No-
Not Detected
CA Time...
Waiting For Update
Time GBAM: 00:02:DE:81:F1:0E
App GBAM: 0600Version: 0010
Purchase GBAM:
EMMs Received:0
Decryption Fail: Never
Active Program(s)
-LTSID-PrgNo-Status-ECM-CCI-EID
N/A-11-Clear-N/A-N/A-N/A
```

Screen Fields and Values

Field Name	Description	Possible Values
System Id	An ID that describes the type of CA system that is supported by the CableCARD Note: This field is a PowerTV parameter	<ul style="list-style-type: none"> • [0x0E00]—required value
Status	The current operating status for the PowerKEY CA supported by the CableCARD Note: This field is a PowerTV parameter	<ul style="list-style-type: none"> • Ready—desired value; PowerKEY launched successfully • Not Ready-No CA Strm—CA stream is not available • Not Ready-No Time GBAM—CA stream is available but waiting for Time GBAMs • Not Staged—CableCARD is not provisioned in the headend • N/A—Initialization or an internal problem while attempting to receive the status
Internal Secure Micro Serial Number	The 6-byte MAC address for the Internal Secure Micro Element (for PowerKEY) Note: This field is a PowerTV parameter.	<ul style="list-style-type: none"> • Unique per CableCARD Example: 00:14:F8:F1:0A:5D • N/A
External Secure Micro Serial Number	The 6-byte MAC address for the External Secure Micro Element	<ul style="list-style-type: none"> • Unique per CableCARD Example: 00:14:F8:F1:0A:5D • Not Detected—External Secure Micro is not present
CA Time	Current authenticated time received through the global broadcast authenticated message (GBAM) (MMDD.hhmmss)	<ul style="list-style-type: none"> • [Time] Note: This value matches the current time to the nearest minute. • Waiting For Update—time not yet received

CABLECARD M-CARD

Field Name	Description	Possible Values
Time GBAM	Counter for the number of Time GBAM messages received	<ul style="list-style-type: none"> • [Any integer >= 1] • 0—Time GBAMs not yet received
App GBAM	Counter for the number of Application GBAM messages received	<ul style="list-style-type: none"> • [Any integer >= 1] • 0—Application GBAMs not yet received
Version	The PowerKEY software version	<ul style="list-style-type: none"> • [Software-dependent]
Purchase GBAM	Counter for the number of purchase GBAMs received	<ul style="list-style-type: none"> • [Any integer >= 1]
EMMs Received	A counter indicating the number of messages for each message type that is validated by the external security element (ESE), also known as a smart card.	<ul style="list-style-type: none"> • [Any integer >= 1] • 0—EMMs not yet received
Decryption Fail	Number of times the Secure Micro failed to process the commands or command timeout count	<ul style="list-style-type: none"> • [Any integer > 0] • Never—Secure Micro has not failed
Active Program(s)	A list of active programs Note: For SCARDs, only one row of information exists. For MCARDs, active program lists are dependent upon the capability of the host to support multiple the host to support multiple	<ul style="list-style-type: none"> • LTSID—local transport stream ID assigned by the Host <ul style="list-style-type: none"> - [Any integer > 0] - N/A: CableCARD is an SCARD • Prg No—[Any integer >= 1] which is the program number running on a particular stream identified in the LTSID • Status—indicates if active programs are: <ul style="list-style-type: none"> - Clear: free to air - Ent: encrypted program is entitled - Not-Ent: encrypted program is not entitled • ECM—the ECM count <ul style="list-style-type: none"> - [Any integer >= 1] - N/A: not a clear program • CCI—Copy Control Information <ul style="list-style-type: none"> - 0—copying not restricted - 1—no further copying is permitted - 2—one generation copy is permitted - 3—copying is permitted - N/A—clear program • ED—the entitlement ID <ul style="list-style-type: none"> - [Entitlement ID] - N/A: clear program

This section provides an overview of the SA CableCARD/Host ID Screen, including the fields and parameters that are included in the screen. This screen provides information that identifies the CableCARD module, as well as the host (TV).

Performing Tasks

By accessing this screen, you can perform the following tasks:

- Determine the customer service number you need to start service for an SCARD or an MCARD on a one-way host
- Verify whether or not the host is one- or two-way capable

Example:

In order to start service for
this device, please contact
customer service at
Ph #(888) 123-4567
CableCARD(tm): **0-010-334-695-847**
Host ID: **0-025-437-849-620**
Host Type: **Two-way**

Screen Fields and Values

Field Name	Description	Possible Values
CableCARD(tm)	Indicates the unique identification number for the CableCARD that is inserted into the host	• {CableCARD dependent}
Host ID	Indicates the unique identification number for the host device certificate ID	• [Host dependent]
Host Type	Indicates if the host is capable of two-way or only one-way communication	<ul style="list-style-type: none"> • Two-way—indicates that the host is capable of downstream and upstream communications between the headend and DHCTs • One-way—indicates that the host is capable only of downstream communication from the headend to DHCTs

Introduction

This section provides an overview of the SA CableCARD IP Service screen, including the fields and parameters that are included in the screen. This screen provides information that identifies the network information for the Internet protocol (IP).

Performing Tasks

By accessing this screen, you can perform the following tasks:

- Determine the IP address for the CableCARD that was assigned by the Digital Network Control System (DNCS)
- Determine when the last forward purchase message poll occurred

Example:

Scientific Atlanta CableCARD(tm)
IP Service

IP Address:
Subnet Mask:
IPPV:
FPM Poll-
N/A

CABLECARD M-CARD

Screen Fields and Values

Field Name	Description	Possible Values
IP Address	The IP address assigned by the DNCS to the CableCARD after successfully switching to two-way mode	<ul style="list-style-type: none">• [Network dependent]• N/A—one-way host
Subnet Mask	The IP subnet mask address assigned to the CableCARD by the DNCS	<ul style="list-style-type: none">• [Network dependent]• N/A—one-way host
IPPV	Indicator for IPPV support	<ul style="list-style-type: none">• Supported—two-way host supports IPPV• N/A—one-way host does not support IPPV
FPM Poll	The data and time of the last forward purchase message (FPM) poll request (MMDD.hhmmss)	<ul style="list-style-type: none">• [Time]• N/A—no request received

Introduction

This section provides an overview of the SA CableCARD DAVIC Info screen, including the fields and parameters that are included in the screen. This screen provides information that identifies data in relation to the DAVIC network interface.

Performing Tasks

By accessing this screen, you can perform the following tasks:

- Determine if the host device is capable of one- or two-way communication.
- Determine various data specific to the forward data channel (FDC).
- Link to related data (Reverse Data Channel [RDC] and Receive/Transmit [RX/TX] Statistics).

Example:

Scientific Atlanta CableCARD(tm)
Network Interface-DAVIC

Host Type: **Two-way**
FDC Status
Frequency: **106000 kHz**
Data Rate: **1.544 Mbps**
RS Corr Err: **0**
RS Uncorr Err: **0**
Status: **Locked**
Link to RDC Info
Link to RX/TX Statistics

Screen Fields and Values

Field Name	Description	Possible Values
Host Type	Indicates if the host is capable of two-way DAVID or only one-way communication or one-way DSG mode	<ul style="list-style-type: none"> • Two-way—indicates that the host is capable of downstream and upstream communications between the headend and DHCTs • One-way—indicates that the host is capable only of downstream communication from the headend to DHCTs
Frequency	Frequency of the tuned QPSK receiver (kHz)	<ul style="list-style-type: none"> • Dependent upon setting: Range:70000-130000
Data Rate	Data rate of the QPSK forward path (Mbps)	<ul style="list-style-type: none"> • Dependent upon setting: Range: 1.544 – 3.088
RS Corr Err	Number of Reed Solomon correctable errors for forward QPSK forward path	<ul style="list-style-type: none"> • 0-0xFFFFFFFF
RS Uncorr Err	Number of Reed-Solomon uncorrectable errors for forward QPSK forward path Note: Uncorrected errors can result in packet loss	<ul style="list-style-type: none"> • 0-0xFFFFFFFF
Status	QPSK receive tuner lock status	<ul style="list-style-type: none"> • Locked—desired value • Not Locked

Network Interface-DAVID RDC

Example:

```

Scientific Atlanta CableCARD(tm)
Network Interface-DAVIC RDC
-----
Frequency: N/A
Data Rate: N/A
Power Level: N/A
Ranging Delay: N/A
Status: N/A

```

Screen Fields and Values

Field Name	Description	Possible Values
Frequency	Frequency for the QPSK transmitter (kHz)	<ul style="list-style-type: none"> • Range: 8000 – 26500 N/A
Data Rate	Data rate of the QPSK reverse path (Mbps)	<ul style="list-style-type: none"> • 0.256 • 1.544 • 3.088 • N/A
Power Level	Power level set at the QPSK transmitter (dBmV)	<ul style="list-style-type: none"> • Range: 24 - 60
Ranging Delay	Ranging delay to adjust the clock timing for reverse transmission on the QPSK (uS)	<ul style="list-style-type: none"> • Range: 0 - 0xFFFF
Status	Current operating status for the QPSK transmit tuner	<ul style="list-style-type: none"> • Locked—desired value • Not Locked • N/A

CABLECARD S-CARD

DAVIC – RX/TX Statistics

Example:

```
Scientific Atlanta CableCARD(tm)
DAVIC – Rx/Tx Statistics
-----
DAVIC: 3156
BROADCAST: 2912
BFS: 564
CA: 123
PASSTHRU: 0
NETWORK: 0
RDC Ranging: 0
RDC SA: 0
RDC SA: 0
RDC RESV: 0
RDC TDMA: 0
```

Screen Fields and Values

Field Name	Description	Possible Values
DAVIC	Number of transmit and receive packets across a DAVIC connection	•0 – 0xFFFFFFFF
BROADCAST	Number of broadcast packets received	•0 – 0xFFFFFFFF
BFS	Number of BFS packets received	•0 – 0xFFFFFFFF
CA	Number of CA packets received	•0 – 0xFFFFFFFF
PASSTHRU	Number of passthru packets received	•0 – 0xFFFFFFFF
NETWORK	Number of network packets received	•0 – 0xFFFFFFFF
RDC Ranging	The number of calibration transmissions between the QPSK modem and the DHCT performed during DAVIC sign-on that achieves the RDC (reverse data channel) power level	•0 – 0xFFFFFFFF
RDC SA	Number of SA packets transmitted	•0 – 0xFFFFFFFF
RDC SA	Number of SA packets transmitted	•0 – 0xFFFFFFFF
RDC RESV	The number of reserved slot transmission packets transmitted on the RDC	•0 – 0xFFFFFFFF
RDC TDMA	The number TDMA (time division multiple access) packets transmitted on the RDC	•0 – 0xFFFFFFFF

Introduction

This section provides an overview of the SA CableCARD CP Info diagnostic screen, including the fields and parameters that are included in the screen. This screen provides information about content protection (CP).

Performing Tasks

By accessing this screen, you can perform the following tasks:

- Verify the current copy protection authorization status for the CableCARD module
- Verify the ECM and EMM counts
- Determine the current status of the PowerKEY conditional access system.

Example:

```

Scientific Atlanta CableCARD(tm)
CP Information
-----
Auth Status: CP Auth Received
Prog number: 2
CCI byte: 0x03
ECM count: 23
EMM count: 0
Decryption status: OK
PowerKey status: Ready
EID : 0x2
MKS period : 60 seconds

```

Screen Fields and Values

Field Name	Description	Possible Values
Auth Status	The current status of the CableCARD-host authentication (binding)	<ul style="list-style-type: none"> • CP Auth Received— authorization has been received from the headend by the CableCARD/Host pair and the authentication and binding are complete • Waiting for CP Auth—waiting for CP authorization from the headend • CP Failure—CP session failure or authorization keys do not match; all decryption is disabled • Invalid Host Cert—certificate is invalid and the binding has failed • Info not available—unknown state
Prog number	The program number running on a specific stream that is identified by the LTSID	<ul style="list-style-type: none"> • [Any integer > 0] • 0—LTSID not used
CCI byte	The level of copy protection passed from the CableCARD device to the host	<ul style="list-style-type: none"> • 0x00—Copy Freely • 0x01—No More Copies • 0x02—Copy One Time • 0x03—Copy Never
ECM count	The number of entitlement control messages (ECMs) received by the CableCARD module	<ul style="list-style-type: none"> • [Any integer >= 0] Note: This value will increment when ECMs are received.
EMM count	The number of entitlement management message (EMM) packets that have been received by the CableCARD module	<ul style="list-style-type: none"> • [Any integer >= 0] Note: The EMM count should increase every 4 seconds.
Decryption status	The current status for the decryption of an encrypted program	<ul style="list-style-type: none"> • OK • No longer authorized • ECM stream error • Blacked out
PowerKey status	The current status of the PowerKEY conditional access system	<ul style="list-style-type: none"> • Ready • Not Ready – Waiting for EMMs • Not Ready – Waiting for • TimeNot • Ready – Waiting for EUT
EID	The entitlement identification (EID) for the attempted purchase	<ul style="list-style-type: none"> • [Hexadecimal number]
MKS period	The maximum rate (seconds) that copy protection keys are refreshed from BFS	<ul style="list-style-type: none"> • [Any integer > 0] Default: 60 seconds

CABLECARD M-CARD

Introduction

This section provides an overview of the SA CableCARD Diag Screen, including the fields and parameters that are included in the screen. This screen provides information that identifies the current status for the CableCARD module.

Performing Tasks

By accessing this screen, you can perform the following tasks:

- Determine the hardware model and version number for the CableCARD module.
- Determine the MAC address for the CableCARD module.
- Determine the version of the operating system that is currently loaded onto the CableCARD module.

Example:

```
Scientific Atlanta CableCARD(tm)
Diagnostics
-----
H/W Model: 0600Version: 0010
MAC addr: 00:02:DE:81:F1:0E
Mode:
Boot Time
Mon Sep 1 2003, 12:01:52 AM GMT
Current Time
Thu Mar 2 2006, 5:31:01 PM GMT
Generic Host Diagnostics
Heap Size: 1024 kB Mem Free: 1024 kB
Bldr Ver: 114OS Ver: 01.00.24
Group Id: 0xFFFF
BFS: Received
Current resource status:C3F1DBF
```

Screen Fields and Values

Field Name	Description	Possible Values
H/W Model	The hardware model number associated with CableCARD module	<ul style="list-style-type: none">• 600—for SCARDS• 800—for MCARDS
MAC addr	The RF network adapter MAC address that is used by the DNCS	<ul style="list-style-type: none">• [CableCARD-dependent]]
Mode	The operations mode of CableCARD	<ul style="list-style-type: none">• S MODE—indicates a single stream-capable mode (SCARD or MCARD can function in S MODE)• M MODE—indicates a multistream-capable CableCARD (MCARD are only capable of functioning in M MODE)
Boot Time	The date and time that the system was last booted	<ul style="list-style-type: none">• [Date, Time]
Current Time	The current date and time	<ul style="list-style-type: none">• [Date, Time]
Heap Size	The total segment of memory claimed by a program	<ul style="list-style-type: none">• 1024 KB
Mem Free	The amount of memory not currently in use	<ul style="list-style-type: none">• [Size varies dynamically]
Bldr Ver	The bootloader version for the CableCARD module	<ul style="list-style-type: none">• [CableCARD-dependent]
OS Ver	The current operating system version for the CableCARD module	<ul style="list-style-type: none">• [CableCARD-dependent] Example: 01.00.24
Group Id	The identification value for the group assigned by the DNCS for CVT download	<ul style="list-style-type: none">• [Hexadecimal value]
BFS	An indication of whether or not the CableCARD receives the root directory from the DNCS	<ul style="list-style-type: none">• Received—desired value• Not Received
Current Resource Status	The status of the resources received (present) and established (opened) sessions	<ul style="list-style-type: none">• [Hexadecimal value]

Introduction

This section provides an overview of the SA CableCARD DSG Info diagnostic screen, including the fields and parameters that are included in the screen. This screen provides information that identifies DOCSIS Set-Top Gateway (DSG) network information.

Important: Data is only available if the host is a two-way host with DSG capability via a DOCSIS modem. If the host is a one-way host, N/A (not available) is displayed for all fields within the diagnostic screen.

Performing Tasks

By accessing this screen, you can perform the following tasks:

Example:

```
Scientific Atlanta CableCARD(tm)
Network Interface - DSG
-----
Mode: N/A
SA DOOBIE MAC addr: N/A
DCD Scanning Status: N/A
Status: N/A
IP Address: N/A
```

Screen Fields and Values

Field Name	Description	Possible Values
Mode	For DHCTs using DSG, indicates the type of communication that the DHCT operates in relation to the headend	<ul style="list-style-type: none"> • OOB—the CableCARD is operating in out-of-band mode • Basic—the CableCARD is operating in Basic DSG mode • One-way—the CableCARD is operating in Basic DSG, one way mode (only receives data downstream from the network to the DHCT with no return path [upstream] to the network) • Advanced—the CableCARD is operating in Advanced DSG mode • Advanced One-Way—the CableCARD is operating Advanced DSG, one-way mode • N/A—the operation of the CableCARD is unknown to the network
SA DOOBIE MAC addr	The DOOBIE MAC address (well known MAC address for all MCARDs that identifies if a DCD is valid)	<ul style="list-style-type: none"> • [MAC Address]—dependent on well known MAC address for MCARDs Example: 00:01:A6:D0:0B:1E
DCD Scanning Status	An indication of whether the card received a valid DCD from the host	<ul style="list-style-type: none"> • DCD Found • Hunting for DCD • N/A—status is unknown
Status	The operating status of the DCD initialization process	<ul style="list-style-type: none"> • Started—switching from DAVIC to DSG has started and DSG initialization is not yet complete • Initialization Err—DSG initialization error has occurred; therefore, continuing in DAVIC mode • Initialized—DSG initialization is complete and successful • N/A—status is unknown
IP Address	The IP address if the CableCARD has acquired a new flow in DSG mode	<ul style="list-style-type: none"> • [Network dependent] • Acquiring—in the process of receiving the IP address

This data was made available by Scientific Atlanta.

CABLECARD M-CARD

M-Card Role

M card will allow a great deal of flexibility in the new cable environment. The M_Card will replace the S_Card in the near future as the only cablecard supplied by the cable companies. This is a card that supports one way and two way communication so VOD and PPV will be accessible by the customer. The units that are available at this time only support one way cablecards. This does not mean that the M_Card will not work the M-Card will work in one or two way modes depending on the support level of the unit. In other words if the unit supports two way cablecard communication then the M-Card will switch to two way mode. Also the same theory applies if the unit supports only one way communication and a M-Card is inserted. A unit that only supports one way communication cannot be upgraded to two way by replacing a S-Card with a M-Card. The circuitry nor the software in the unit designed for one way will support two way communication.

The M-Card device is a key component in the security system between cable operator networks and retail consumer electronics devices. The "M-Card" will operate in a backwards compatible, single-stream, manner when paired with a single stream device (for example, in a UDCP); or in a multi-stream manner when paired with a multi-stream device.

Downloadable Conditional Access System (DCAS™)

DCAS offers a cost-effective, network-agnostic solution for interactive two-way devices that connect to cable systems, allowing cable operators to download their conditional access system(s) of choice to devices connected to the cable network. LG was the second company to sign with the DCAS. This will allow the cable system to safely access the host and make changes to the access or systems. This is a downloadable security for conditional access verses the cablecard or box. Downloadable security is also less expensive than the present system is. It will also allow equipment to operate on any cable system. In some early testing Motorola equipment operated on a Scientific Atlanta system and Scientific Atlanta equipment operated on a Motorola system and with a NagraVision system.

DCAS is designed to operate with interactive cable set-top boxes as well as integrated DTVs (digital televisions with built-in set-top capabilities), and other retail devices that include a special chip. This will allow all types of systems to work together. EX: SA equipment will operate on a Motorola headend when it is all completed DCAS will replace the CableCARD. There are other potential benefits to DCAS. For starters, DCAS should also all but eliminate the conditional access duopoly that exists today, since most cable systems base their digital systems on either Motorola's Digicipher platform or Scientific-Atlanta Inc.'s PowerKEY scheme.

The OCAP **OpenCable Applications Platform** specification enables manufacturers and retail distributors of set-tops, television receivers or other devices to build and to sell attractive and capable devices to consumers that will support all services delivered by cable operators to devices currently available to consumers via lease from cable operators.

Goals and milestones:

- A national rollout of DCAS by July 1, 2008
- Q2 2006: Construction to begin on DCAS keying facility; facility to be online by Q3 2006
- Phase II ASIC chip completion by Q3 2007.
- Completion of DCAS network architecture components by Q4 2007; testing of retail and leased devices by Q1 2008.

Term	Definition
APDU	Application Protocol Data Unit: a command, query, and reply message exchange protocol between CableCARD device and Host
APS	Analog Protection System for copy control of analog output video
AuthKey	Authentication Key, calculated by both the CableCARD device and Host as part of the Host authentication process
Authentication	A procedure for the Host and CableCARD device to securely confirm that the other is authentic device for CableCARD-CP binding. Also: a means to securely confirm that a message originated in a trusted source.
CA, CA System	Conditional Access, Conditional Access System – secures delivery of cable services to the CableCARD device
CA-only	The CableCARD device mode of CA-descrambling EMI=0 content and returning it to the Host CP-uncscrambled
Cable	The Cable Television industry, services, systems, or equipment
CableCARD (CARD)	CableCARD device, also referred to as "Point of Deployment" (POD), is a detachable device distributed by cable providers, that connects to the home receiver.
CableCARD Certificate	The unique X.509 certificate issued to each CableCARD device and used for CableCARD authentication. Parameter name: CARD_DevCert.
CableCARD-CP	CableCARD copy protection, as specified in this document
CableCARD CPS	The CableCARD Copy Protection System, as specified in this document
CARD_ID	The CableCARD device's unique identification number
CCI	Copy Control Information
CIT	Constrained Image Trigger. A CCI bit that controls image constraint on component analog outputs
CP	System The Copy Protection System described in this specification
CRL	Certificate Revocation List: the means of reporting bad Host_IDs to cable headends
DCAS	Downloadable Conditional Access System
DES	Data Encryption Standar
DES-ECB	Data Encryption Standard – Electronic Code Book
DFAST	Dynamic Feedback Arrangement Scrambling Technique, a component of the encryption algorithm
DH	Diffie-Hellman, a public key agreement protocol based on the intractability of taking discrete alogarithms over the integer field.
DSG	DOCSIS Set-top Gateway, a method of using DOCSIS protocols to support an out-of-band communication path.
EMI	"Encryption Mode Indicator" As used in this document the meaning of this acronym is "Copy Control" Mode Indicator for digital outputs. The acronym EMI is used by the DTLA and is retained here for consistency.
EMM	Entitlement Management Message
Encrypted	Data modified to prevent unauthorized access (compare with "scrambled")
FAT	Forward Application Transport, the 6 MHz digital channels from headend to home and between CableCARD device and Host
FDC	Forward Data Channel
Headend	he cable operator's facility which acts as the source of cable signals, services, and conditional access control.
Host	The consumer device used to access and navigate cable content. Typically a digital TV or settop DTV receiver.
Host Certificate	The unique X.509 certificate issued to each Host device and used for Host authentication. Parameter name: Host_DevCert
Host_ID	The Host device's unique identification number
lsb	Least Significant Bit, of a specified binary value
LTSID	Local Transport Stream ID
M-CARD	Multi-Stream CableCARD device
MMI	Man Machine Interface
MPEG	The ISO/IEC 13818 specifications and ISO/IEC 13818-1 in particular
msb	Most Significant Bit, of a specified binary value
Nonce	A random value generated fresh for each use and included in some Host-CableCARD exchanges to make each exchange unique

CABLECARD M-CARD

Term	Definition
OCAP™	OpenCable Applications Platform
Pass-through	The CableCARD device mode of passing CA-scrambled back to the Host unchanged, leaving it unusable by the Host
PHI POD	Host Interface as specified in SCTE 27
PHICA POD	Host Interface Certificate Authority, root X.509 certificate administrator for X.509 certificates on the PHI. Identified under PHILA.
PHILA POD	Host Interface Licensing Agreement, covers the DFAST technology and specifies the PHI Certificate Authority - PHICA
Point of Deployment (POD)	A POD, also referred to as a CableCARD device, is a detachable device distributed by cable providers, that connects to the home receiver.
RDC	Return Data Channel: a communication channel on the coaxial cable that delivers the main cable service but running "upstream" from home to the headend
Report-back	The action or process of reporting information from the CableCARD device or Host back to the headend
Rescramble	The CableCARD mode of CA-descrambling and CP-scrambling content
RSA algorithm	An RSA Security defined commercial public key cryptographic algorithm
S-CARD	Single Stream CableCARD. The PHI specified in SCTE 28 2003 and SCTE 41 2003. Devices compliant with this specification will be capable of operating in backward compatible singlestream mode compliant with those earlier specifications.
SATP	Simple Authenticated Tunnel Protocol
Scrambled	Content modified to prevent unauthorized access (compare with "encrypted")
SHA-1	Secure Hash Algorithm, a cryptographic compression function
SPDU	Session Protocol Data Unit (SPDU)
SSK	A shared secret system parameter used by both CableCARD device (SSKP) and Host (SSKH) to authenticate the exchange of Diffie-Hellman public key parameters.
Validation	The process of reporting the Host_ID to the system operator, checking it against a revocation list, reporting the validated Host_ID back to the CableCARD device, and the CableCARD device confirming it matches the stored Host_ID.
X.509	The ITU-T Recommendation X.509 standard
XCA	X.509 certificate authority

BUILT-IN DIGITAL VIDEO RECORDER (DVR)

TROUBLESHOOTING

The HDD is not a parallel portion of the video circuit but a series part of the video circuit. This allows instant record as a feature for the customer. If you suspect the HDD, the easiest way is to remove the IDE cable from the HDD, or disconnect this cable from the Digital PCB, and turn the unit back on. The software automatically senses the presence of the HDD. Do not connect or disconnect these cables with the unit connected to A/C power because this can damage the HDD and the digital PCB. This also allows the technician to remove or disconnect the HDD and allow the customer to continue using the unit till the new HDD arrives and can be installed.

COMMON ERRORS

Message	Note
No HDD is detected. Please contact customer service h	HDD connection error.
Not enough HDD space.	HDD is full
Buffering stopped. Recovering from HDD error.	HDD error recovery program has started
Cannot enter DVR Mode in current input source.	DVR mode is possible for only RF, Composite and 1394 signal
Cannot play recorded program.	Recorded program A/V file error
HDD is not detected. Please contact service center.	Unknown HDD detection error.
No signal for DVR function.	Signal is too weak to enter Recording or Timeshift
Invalid input signal for DVR function.	DVR mode is possible for only RF, Composite and 1394 signal

HDD RELATED ERRORS (TIMER RECORDING)

Message	Note
Timer recording cannot start due to HDD error.	HDD problem. Bad sector or bad connection or other
Timer recording cannot start due to bad signal.	Signal strength is too weak to start recording
Timer recording cannot start. No recording space.	HDD recording space is full
Timer recording cannot start. Reached maximum number of recordings.	Maximum number of recorded program is 500. User must delete recorded program to start record.
Timer recording cannot start. Please set current time.	Current time must be set before timer recording starts
Timer recording cannot start. Channel is invalid.	Channel number is invalid
Timer recording cannot start. Copy protected.	Current Program is copy protected
Timer recording cannot start. DVR device error.	Device problem. Hardware error occurred.
Cannot display Auto Demo when timer recording starts.	starting timer recording. Auto Demo can start once recording is started.
Cannot display Photo List when timer recording starts.	starting timer recording. Photo list can start once recording is started.
Cannot display Music List when timer recording starts.	starting timer recording. Music list can start once recording is started.
Stop current recording to start timer recording.	Current recording must be stopped before timer recording.
Stop current playback to start timer recording.	Current playback must be stopped before timer recording.
Set current time for timer recording.	Current time must be set before timer recording starts

HDD RELATED ERRORS CONTINUED (TIMER RECORDING)

Message – timer record failed programs in RecordedTv list	Note
Timer record failed due to no disk space.	HDD recording space is full
Timer record failed due to no signal.	Signal strength is too weak
Timer record failed due to DVR device error.	Device problem. Hardware error occurred.
Timer record failed. Reached maximum number of recordings.	Maximum number of recorded program is 500. User must delete recorded program to start record.
Timer record failed. Recording duration is less than 10 seconds.	Record length must be longer than 10 seconds
Timer record failed. Temperature is below zero.	Temperature is too low
Message – timer record failed programs in Gemstar PlayList	Note
Timer record failed due to no disk space. Do you want to delete?	HDD recording space is full
Timer record failed due to no signal. Do you want to delete?	Signal strength is too weak
Timer record failed due to DVR device error. Do you want to delete?	Device problem. Hardware error occurred.
Timer record failed. Reached maximum number of recordings. Do you want to delete?	Maximum number of recorded program is 500. User must delete recorded program to start record.
Timer record failed. Recording duration is less than 10 seconds. Do you want to delete?	Record length must be longer than 10 seconds
Timer record failed. Temperature is below zero. Do you want to delete?	Temperature is too low

HDD RELATED ERRORS CONTINUED (PROGRAM ERRORS)

Message - From Gemstar Guide PlayList	Note
Cannot play Recorded Program due to bad sector. Do you want to delete?	HDD bad sector. Select "YES" to delete the program
Cannot play Recorded Program due to copy protection. Do you want to delete?	copy protected. Select "YES" to delete the program
Cannot play recorded program due to file error. Do you want to delete?	Cannot find A/V file. Select "YES" to delete the program
Message - From RecordedTv List	Note
Cannot play Recorded Program due to bad sector.	HDD bad sector.
Cannot play Recorded Program due to copy protection.	copy protected Video.
Cannot play recorded program due to file error.	Cannot find A/V file
HDD playback stops because of HDD problem.	HDD problem. Bad sector or bad connection or other
HDD playback stops, cannot save clip editing because of HDD problem.	HDD problem. Clip edit is not saved
HDD playback halts due to HDD problem. HDD Recovery begins.	HDD error recovery program has started
Delete a program which has been played because of HDD problem.	Fatal DVR error a HDD data is deleted
Delete all recorded programs because of DVR problem.	Fatal DVR error all HDD data is deleted

HDD RELATED ERRORS CONTINUED (TIMESHIFT ERRORS)

Message	Note
Timeshift stops because of HDD problem.	HDD problem. Bad sector or bad connection or other
Timeshift cannot start. Audio only program.	Cannot Timeshift audio only channel
Timeshift cannot continue. Audio only program.	Cannot Timeshift audio only channel
Timeshift halts due to HDD problem. HDD Recovery begins.	HDD problem. Bad sector or bad connection or other
Stop timeshift due to copy protection.	Current Program is copy protected
Cannot timeshift due to copy protection.	Current Program is copy protected

HDD RECORDING ERRORS

Message	Note
Recording halts due to HDD problem.	HDD problem. Recording stops
Stop recording due to copy protection.	Copy protection detected during recording.
Cannot record due to copy protection.	Copy protection detected before recording starts.
Do you want to stop recording before power off?	"Yes" will stop record. "No" will continue record. In both cases, display will be turned off
Recording stops as recording space is full	HDD recording space is full
Recording stopped. Recovering from HDD error.	HDD error recovery program has started
Recording stopped. No recording space.	HDD recording space is full
Reached maximum recording duration.	Cannot add record duration if current record duration is 5hr or bigger.
Invalid input signal for recording.	Record is possible for only RF, Composite and 1394 signal
Recording halts. HDD recovery will begin.	HDD error recovery program starts
Recording cannot start No recording space.	HDD recording space is full
Recording failed. Length is less than 10 seconds.	Record length must be longer than 10 seconds
Reached maximum number of recordings.	Maximum number of recorded program is 500. User must delete recorded program to start record.
Cannot change to another digital channel while recording digital channel.	Watching digital channel while recording another digital channel is not possible

HDD EDITING ERRORS

Message	Note
Editing failed. Length is less than 10 seconds.	Each clip edit length must be longer than 10 seconds
Editing failed. Length is less than 10 seconds. HDD playback stops.	
Reached maximum number of clip editing.	Maximum number of clip editing is 10.

HDD RECOVERY

Message	Note
Bad sector occurred in critical regions of photo drive. Do you want to format photo drive?	Bad sector. Format photo-list
Bad sector occurred in critical regions of music drive. Do you want to format music drive?	Bad sector. Format music-list
Bad sector occurred in critical regions of HDD. Do you want to format HDD?	Bad sector. Format HDD
DVR initialization has failed.	DVR initialization error.
DVR device error.	DVR hardware error.
DVR needs HDD Initialization. Do you want to perform?	"Yes" will start DVR re-initialization.
HDD recovery is in progress. Please try again later.	HDD error recovery program in progress
HDD recovery has failed. Please contact service center.	Unknown HDD detection error.
HDD initialization is in progress. Please try again later.	DVR initialization in progress
DVR initialization cannot start because of low temperature.	DVR initialization cannot start.
HDD recovery begins.	HDD error recovery program starts
Do you want to format HDD?	HDD error. "Yes" will start format
HDD format has failed. Please contact service center.	Unknown HDD detection error.
Processing HDD format.	HDD error recovery program started

